

Overview

Overview of iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

For full technical specifications, refer to Apple Support Tech Specs: support.apple.com/specs/imac.



Serial Number Location

The serial number for the following iMac models is located on the bottom of the stand. **Note:** If the computer has a VESA mount, then the serial number is located on the underside of the VESA mount tongue.

- iMac (21.5-inch, Late 2012)
- iMac (27-inch, Late 2012)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2013)
- iMac (27-inch, Late 2013)
- iMac (21.5-inch, Mid 2014)
- iMac (Retina 5K, 27-inch, Late 2014)
- iMac (Retina 5K, 27-inch, Mid 2015)
- iMac (21.5-inch, Late 2015)
- iMac (Retina 4K, 21.5-inch, Late 2015)
- iMac (Retina 5K, 27-inch, Late 2015)

When replacing the stand, use a fine-tip black permanent marker to neatly write the serial number on the bottom of the new stand. **Note:** If replacing the VESA mount tongue, then write the serial number on the underside of the VESA mount tongue.



Magic Trackpad 2, Magic Mouse 2, and Magic Keyboard

Magic Trackpad 2, Magic Mouse 2, and Magic Keyboard



- Pairs via Bluetooth or via Lightning connector
- Force Touch technology (Magic Trackpad 2)
- Embedded battery
- On/off switch
- Lightning connector
- Can be used wired or wireless (Magic Trackpad 2 and Magic Keyboard 2)

Note: Magic Mouse 2 and Magic Keyboard require a Bluetooth-enabled Mac computer that is running OS X 10.11.1. Magic Trackpad 2 requires a Mac computer with Bluetooth 4.0 that is running OS X 10.11.1.

Turn on the device:

- To turn on the device, use the on/off switch. This switch is located on the back of the device for Magic Trackpad 2 and Magic Keyboard, and on the bottom of the device for Magic Mouse 2. If green is visible inside the switch, then the device is turned on. **Note:** When the Magic Keyboard is turned on and paired with a system, the Caps Lock LED will light up when Caps Lock is active.

Magic Trackpad 2 (back)



Magic Keyboard (back)



Magic Mouse 2 (bottom)



1 = On/off switch

2 = Lightning connector

Pair the device:

- Magic Trackpad 2, Magic Mouse 2, and Magic Keyboard will automatically pair when plugged in. Plug the device into a USB port on the computer and it will be detected.
- The device can also be paired wirelessly. Turn the device on, find the name in the Bluetooth preference pane, and click the name to pair.

Note: To check if the device is turned on, go to System Preferences > Bluetooth or click the Bluetooth icon in the menu bar. If the device is both turned on and paired with the computer, then it will show in bold.

Charge the device:

- Plug the device into a USB port on the computer using the Lightning cable.
- Plug the device into a 5W, 10W, or 12W Apple USB Power Adapter using the Lightning cable.

Note: The computer will show an alert when the battery is low. The battery level information can also be found by selecting the device in the Bluetooth menu in the menu bar.

General Troubleshooting

Update Software and Firmware

Important: Before you begin troubleshooting, ensure the correct version of OS X is installed, and check for and apply the latest software and firmware updates. Computers sometimes exhibit symptoms that indicate the wrong version of OS X system software is installed. Check article [HT204319: OS X versions and builds included with Mac computers](#) to make sure system build is correct for this computer model.

Firmware is the name given to software that is written into memory circuits such as flash memory, that will hold the software code indefinitely, even when power is removed from the hardware. Firmware on Intel Mac computers is designed to be updated if necessary by running the OS X Software Update check (available in the Apple () menu) while the computer is connected to the Internet.

For more information about firmware updates, refer to article [HT201518: About EFI and SMC firmware updates for Intel-based Mac computers](#).

Troubleshooting Techniques

For more information, go to [ATLAS](#) and enter "troubleshooting" in the search field.

Hardware vs. Software

To isolate a hardware issue from a software issue, refer to article [HT203161: Isolating issues in Mac OS X](#).

To troubleshoot a software issue, refer to the following articles:

- [HT201516: Mac OS X: How to troubleshoot a software issue](#)
- [HT201861: About incompatible software on your Mac](#)
- [HT204323: If a flashing question mark appears when you start your Mac](#)
- [HT204904: How to reinstall macOS](#)
- [HT202574: Mac mini \(Late 2012 and later\), iMac \(Late 2012 and later\): About Fusion Drive](#)

Power-On Self-Test (POST)

Intel-based Mac computers such as the iMac rely on a combination of tones and blinking LED lights to display Power-On Self-Test (POST) error codes.

- If the computer detects out-of-specification or no Random-Access Memory (RAM), the screen will remain black but the computer will beep. This error condition may be due to physically damaged RAM, installing an incorrect type of RAM, or not having RAM installed.
- Some RAM may appear to pass POST, but still cannot be used by the operating system. In this case, the computer will display a gray screen, sound three beeps and repeat beeps until computer is turned off.
- The solution to both of these situations is to first re-seat RAM and test computer again. If RAM fails POST again, remove all installed RAM and test by installing one by one each RAM module that has been verified to work correctly on another computer (i.e., "known-good" RAM) or order new RAM.
- A sequence of tones heard at startup or a no video symptom may also be fixed by temporarily removing/replacing the backup battery.

For more information, refer to article [HT202768: About Mac computer startup tones](#).

Quick Check Procedures

Resetting the System Management Controller (SMC)

The System Management Controller (SMC) is a chip on the logic board that controls all power functions. If the computer is experiencing any power issue, such as not starting up, not displaying video, sleep issues, or fan noise issues, resetting SMC may resolve it.

For more information and instructions to reset the SMC on different computer models, refer to article [HT201295: Reset the System Management Controller \(SMC\) on your Mac](#).

Note for iMacs: If the power button is pressed while inserting the power cord, the iMac will enter a mode in which the fans run at full speed. For more information, refer to article [HT204463: iMac: Fans run at full speed after computer turns on](#).

Resetting Non-Volatile RAM (NVRAM)

NVRAM stores certain system and device settings in a location that OS X can access quickly. Exactly which settings are stored in the computer's NVRAM varies depending on the type of computer as well as the types of devices and drives connected. To reset NVRAM:

1. Shut down the computer.
2. Locate the following keys on the keyboard: Command, Option (Alt), P, and R. You will need to hold these keys down simultaneously in Step 4.
3. Press power button.
4. Immediately press and hold Command-Option-P-R keys.
Important: You must press this key combination before the gray screen appears.
5. Hold down keys until computer restarts, and you hear startup chime a second time.
Note: For MacBook Pro (Late 2016), hold down keys for at least 20 seconds. There is no startup chime.
6. Release keys.

Note: After resetting NVRAM, you might need to reconfigure settings for speaker volume, screen resolution, startup disk selection, and time zone information.

For more information, refer to article [HT204063: How to Reset NVRAM on your Mac](#).

Starting Up in Safe Mode

Safe Mode (sometimes called Safe Boot) is a way to start up a Mac so that it performs certain checks, and prevents some software from automatically loading or opening. These changes can help resolve or isolate certain issues on the startup disk.

Follow these steps to start up into Safe Mode:

1. Be sure the computer is shut down.
2. Press the power button.
3. Press and hold the Shift key.
Note: The Shift key should be pressed as soon as possible after the power button is pressed.
4. Release the Shift key when you see the Apple logo appear on the screen. After the Apple logo appears, it may take longer than usual to reach the login screen. This is because the computer is performing a directory check as part of Safe Mode.
5. To leave Safe Mode, restart the computer without pressing any keys during startup.

For more information, refer to article [HT201262: Try safe mode if your Mac doesn't finish starting up](#).

Recovering a Lost Firmware Password

Only Apple Retail Stores or Apple Authorized Service Providers can unlock the following Mac models when protected by a firmware password:

- MacBook Air (Late 2010 and later)
- MacBook Pro (Early 2011 and later)
- MacBook Pro with Retina display (all models)
- iMac (Mid 2011 and later)
- Mac mini (Mid 2011 and later)
- Mac Pro (Late 2013)
- MacBook (Retina, 12-inch, Early 2015 and later)
- MacBook Pro (Late 2016)

Refer to the technician instructions in article [HT203409: If you lost or forgot your firmware password](#).

Diagnostic Software

Diagnostic Software for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

	Apple Service Diagnostic (ASD)	Apple Hardware Test (AHT)	Apple Diagnostics
iMac (27-inch, Late 2012)	3S157	3A244	n/a
iMac (27-inch, Late 2013)	3S157	n/a	v1.0.1 or later
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)	use AST 2, see below	n/a	v1.0.1 or later

Important: If the Mac being serviced was introduced before June 2013, use Apple Hardware Test (AHT) instead of Apple Diagnostics. For more information on Apple Diagnostics, refer to [HT202731: Using Apple Diagnostics](#).

Apple Service Toolkit 2 (AST 2)

AST 2 is a cloud-based diagnostic system to help technicians triage and verify repairs for Mac computers released in Mid 2014 and later, except for MacBook Pro (Retina, Mid 2014). With AST 2, technicians will be able to initiate diagnostics wirelessly on a user's device using a Diagnostic Console (a web application on a Mac or iPad). Technicians will also be able to view diagnostic results on the Diagnostic Console.

For more information, refer to the following articles:

- [OP476: Latest Apple Service Toolkit download links and documentation](#)
- [TP1105: AST 2 Reference Guide - Table of Contents](#)
- [TP1118: AST 2 Reference Guide - Table of Contents \(Retail\)](#)

Apple Service Toolkit (AST)

AST is a suite of diagnostic tools that checks Intel-based Mac hardware components and provides detailed diagnostic logs for review. AST runs on a local server, managing multiple Ethernet clients via NetBoot.

For more information, refer to the following article:

- [TP586: AST Reference Guide - Table of Contents](#)

Mac Resource Inspector (MRI)

MRI, which is part of AST, is a quick triage tool that checks for the presence of hardware and reports sensor readings. Sensors are located on a variety of parts, including cables, fans, storage devices, the power supply, the display panel, and the logic board. Use MRI to help isolate failures and avoid unnecessary part replacements. MRI complements ASD, which is a more in-depth repair verification tool.

Note: If all AST checks pass and a component is still suspected to be at fault, verify with other diagnostic tools.

iMac (27-inch, Late 2012)

Sensor	Description	Suspected Part Location	Suggested Action
IC0C	CPU Core current	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0G	CPU AXG current	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0I	CPU VCCIO high-side current	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0M	CPU MEM 1.5V current	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.

IC0S	CPU VCCSA high-side current	On logic board	Check cable connections to logic board; test with known-good logic board
ID2R	AC/DC 12V G3H current	On logic board	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
IG0C	GPU Core low-side current	On logic board	Check cable connections to logic board; test with known-good logic board.
IG0F	GPU Frame buffer 1.5V high-side current	On logic board	Check cable connections to logic board; test with known-good logic board.
IH02	3.5 HDD 12V current	On logic board	Check HDD cable connections to logic board; test with known-good HDD.
IH05	3.5 HDD 5V current	On logic board	Check HDD cable connections to logic board; test with known-good HDD.
IH1R	SSD 3.3V current	On logic board	Check SSD logic board connection; test with known-good SSD/flash storage.
IM0R	DIMM 1.5 S3 current	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
IN1R	PCH 1.05V current	On logic board	Check cable connections to logic board; test with known-good logic board.
IR1R	PCH/GPU/TBT 1.05V high-side current	On logic board	Check cable connections to logic board; test with known-good logic board.
TA0p	MLB Ambient cooked temp	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tb0p	BLC Proximity Board temp	On logic board	Check cable connections to logic board; test with known-good logic board.
TC0p	CPU Proximity Board temp	On logic board	Check cable connections to logic board; test with known-good logic board.
TCXr	CPU Max Die temp (PECI)	On logic board	Check cable connections to logic board; test with known-good logic board.
TG0d	GPU Die cooked temp	On logic board	Check cable connections to logic board; test with known-good logic board.
TG0p	GPU Proximity temp	On logic board	Check cable connections to logic board; test with known-good logic board.
TH0O	HDD 00Bv1 Temp	Built into the HDD	Check HDD cable connections to logic board; test with known-good HDD.
TH1R	SSD 1 Gumstick OOB temp max relative	Built into SSD/flash storage	Check SSD/flash storage connection to logic board; test with known-good SSD/flash storage.
TL0p	LCD Flying Lead temp	Mounted to back of LCD display	Check LCD cable connections to logic board; test with known-good LCD display; test with known-good logic board.
TL1p	TCON Local Board temp	Built into LCD display	Check LCD cable connections to logic board; test with known-good LCD display; test with known-good logic board.
Tm0p	MLB PSU Local Board temp	On logic board	Check cable connections to logic board; test with known-good logic board.
Tm1p	MLB GPU Local Board temp	On logic board	Check cable connections to logic board; test with known-good logic board.
TM0p	SO-DIMM 1 Proximity Board temp	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
TM1p	SO-DIMM 2 Proximity Board temp	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
TM2p	SO-DIMM 3 Proximity Board temp	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
TM3p	SO-DIMM 4 Proximity Board temp	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
Tp2h	AC/DC T2 Sec heatsink temp	Built into power supply	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
TPCD	PCH Die temp	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0C	CPU Core voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0G	CPU AXG voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0M	CPU MEM 1.5V voltage	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.

VD2R	AC/DC 12V G3H voltage	On logic board	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
VG0C	GPU Core Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VH05	3.5 HDD 5V voltage	On logic board	Check HDD cable connections to logic board; test with known-good HDD.
VM0R	DIMM 1.5 S3 voltage	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
VN1R	PCH 1.05V voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VR3R	VR 3.3V voltage	On logic board	Check cable connections to logic board; test with known-good logic board.

iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) Thermal Sensors

Name	MRI/ASD Name	Description	Sensor Location	Suggested Action
TA0p	Ambient MLB	Ambient temperature	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tb0p	BLC Proximity	Backlight Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board or/and LCD panel.
TC0p	CPU Proximity O	CPU Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TCXr	ACPU Relative Die Sensor	CPU Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TG0d	GPU Die	GPU Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TG0p	GPU Proximity	GPU Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TH0O	Hard Drive Proximity	Hard Drive	Built into HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known-good HDD, HDD cable, and/or logic board.
TH0o	Hard Disk Out of Band	Hard Drive Out of Band	Built into HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known-good HDD, HDD cable, and/or logic board.
TH1R	SSD 1 OOB max relative	Flash Storage	Built into SSD/flash storage	Check for clogged fans and/or vents; check flash storage card connection to logic board; test with known-good flash storage card and/or logic board.
TL0p	LCD Proximity	LCD	Mounted to back of LCD display	Check for clogged fans and/or vents; check LCD connection to logic board; test with known-good LCD, LCD cable, and/or logic board.
TL1p	TCON Local	LCD Logic board	Built into LCD display	Check for clogged fans and/or vents; check LCD connection to logic board; test with known-good LCD, LCD cable, and/or logic board.
TM0p	SO-DIMM Proximity	SO-DIMM 1 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm0p	MLB DIMM Local Board	MLB PSU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM1p	SO-DIMM2 Proximity	SO-DIMM 2 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm1p	MLB Proximity 1 (CPU)	MLB GPU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM2p	SO-DIMM 3 Proximity	SO-DIMM 3 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm2p	MLB Proximity	CPU backside sensor	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM3p	SO-DIMM 4 Proximity	SO-DIMM 4 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tp2h	AC/DC T2 Secondary Heatsink	Power Supply Secondary Heatsink	Built into power supply	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good power supply, power supply DC cable, and/or logic board.

iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) Electrical Sensors

Name	MRI/ASD Name	Description	Sensor Location	Suggested Action
ALSL	Light Sensor	Ambient Light	On camera board	Check camera cable connections; test with known-good camera, camera cable, and/or logic board.
IC0C	CPU 0 VCore Average	CPU Core Current	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0M	CPU 1.35 S0	CPU Memory Current	On logic board	Check cable connections to logic board; test with known-good logic board.
ID2R	AC/DC 12V G3H current	12V DC Current	On logic board	Check DC power cable connections to logic board; test with known-good power supply and/or logic board.
IG0C	GPU 0 Core	GPU Core low-side Current	On logic board	Check cable connections to logic board; test with known-good logic board.
IG0F	GPU Frame buffer 1.5V high-side	GPU Frame buffer 1.5V Current	On logic board	Check cable connections to logic board; test with known-good logic board.
IG1C	GPU 1.8V	GPU Core high-side Current	On logic board	Check cable connections to logic board; test with known-good logic board.
IH02	3.5 HDD 12V	3.5 HDD 12V Current	On logic board	Check HDD cable connections to logic board; test with known-good hard drive, hard drive power cable, and/or logic board.
IH05	3.5 HardDrive 5V	3.5 HDD 5V Current	On logic board	Check HDD cable connections to logic board; test with known-good hard drive, hard drive power cable, and/or logic board.
IH1R	SSD 3.3V	Flash Storage Card 3.3V Current	On logic board	Check flash storage card connection to logic board; test with known-good flash storage card and/or logic board.
IM0R	Memory I-Sense	DIMM 1.5V Current	On logic board	Check SO-DIMMs; test with known-good SO-DIMMs; test with known-good logic board.
VC0C	CPU 0 Core	CPU Core Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0M	CPU 1.35 S0	CPU Memory Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VD2R	Power Supply 12V S0	12V DC Voltage	On logic board	Check DC power cable connections to logic board; test with known-good power supply and/or logic board.
VG0C	GPU 0 Core	GPU Core Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VG0F	GPU FB	GPU Frame Buffer Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VG1C	GPU 1 Core	GPU Core high-side Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VH05	3.5 HDD 5V	3.5 HDD 5V Voltage	On logic board	Check HDD cable connections to logic board; test with known-good hard drive, hard drive power cable, and/or logic board.
VM0R	DIMM 1.5 S3	DIMM 1.5V Voltage	On logic board	Check SO-DIMM memory modules connections to logic board; test with known-good SO-DIMM memory module and/or logic board.
VR1R	1.05V S0	1.05V Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VR3R	VR 3.3v	MLB 3.3V Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.

Diagnostic Software

Diagnostic Software for iMac (Retina 5K, 27-inch, Late 2015)

Apple Service Toolkit 2 (AST 2)

AST 2 is a cloud-based diagnostic system to help technicians triage and verify repairs for Mac computers released in Mid 2014 and later, except for MacBook Pro (Retina, Mid 2014). With AST 2, technicians will be able to initiate diagnostics wirelessly on a user's device using Diagnostic Console (a web application on a Mac or iPad). Technicians will also be able to view diagnostic results in Diagnostic Console.

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- [TP1118: AST 2 Reference Guide - Table of Contents \(Retail\)](#)

Thermal and Electrical Sensors

Name	MRI/ASD Name	Description	Sensor Location	Suggested Action
TA0p	Ambient MLB	Ambient temperature	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tb0p	BLC Proximity	Backlight Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board or/and LCD panel.
TC0p	CPU Proximity O	CPU Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TCXr	ACPU Relative Die Sensor	CPU Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TG0d	GPU Die	GPU Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TG0p	GPU Proximity	GPU Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TH0O	Hard Drive Proximity	Hard Drive	Built into HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known-good HDD, HDD cable, and/or logic board.
TH0o	Hard Disk Out of Band	Hard Drive Out of Band	Built into HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known-good HDD, HDD cable, and/or logic board.
TH1R	SSD 1 OOB max relative	Flash Storage	Built into SSD/flash storage	Check for clogged fans and/or vents; check flash storage card connection to logic board; test with known-good flash storage card and/or logic board.
TG1d	Graphic Subsystem Temp	LCD	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TL1p	TCON Local	LCD Logic board	Built into LCD	Check for clogged fans and/or vents; check LCD connection to logic board; test with known-good LCD, LCD cable, and/or logic board.
TM0p	SO-DIMM Proximity	SO-DIMM 1 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm0p	MLB DIMM Local Board	MLB PSU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM1p	SO-DIMM2 Proximity	SO-DIMM 2 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm1p	MLB Proximity 1 (CPU)	MLB GPU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM2p	SO-DIMM 3 Proximity	SO-DIMM 3 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm2P	MLB Proximity	MLB Proximity 2 Temp	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TM3p	SO-DIMM 4 Proximity	SO-DIMM 4 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tp2h	AC/DC T2 Secondary Heatsink	Power Supply Secondary Heatsink	Built into power supply	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good power supply, power supply DC cable, and/or logic board.
ALSL	Light Sensor	Ambient Light	On camera board	Check camera cable connections; test with known-good camera, camera cable, and/or logic board.
TPCD	Power Supply	PCH Die Temp	On logic board	Check cable connections to logic board; test with known-good logic board.

Diagnostic LEDs and Test Pads

Diagnostic LEDs and Test Pads for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



Warning: HIGH VOLTAGE. Be extremely careful when working inside the computer while power is applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in. Be very careful not to touch tools to logic board components other than the test pads.

After unplugging the computer from the electrical outlet, wait two minutes before removing the display panel, disconnecting modules, or substituting cables and components. This will allow the power supply and logic board time to discharge.

Refer to the following articles for more information:

- [TP833: iMac and Displays: Power Supply Cover Instructions](#)
- [TP820: iMac \(27-inch\): Safety](#)

iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) models have four diagnostic LEDs and two pairs of test pads that can help you troubleshoot the computer without removing the logic board.

The coin battery located on the back of the logic board provides power to the real-time clock (RTC) and parameter RAM (PRAM) when the computer is not connected to an AC power source. The RTC maintains the date and time, while the PRAM stores information such as speaker volume, screen resolution, startup disk selection, and recent kernel panics. The coin battery is designed to last several years and does not normally require replacement. However, if there are issues with the functions listed above, the RTC and PRAM may need to be reset or the coin battery may need to be replaced.

A. Diagnostic LEDs

- See the full description of LED behaviors below the locator image.

B. Coin Battery Voltage Test Pads

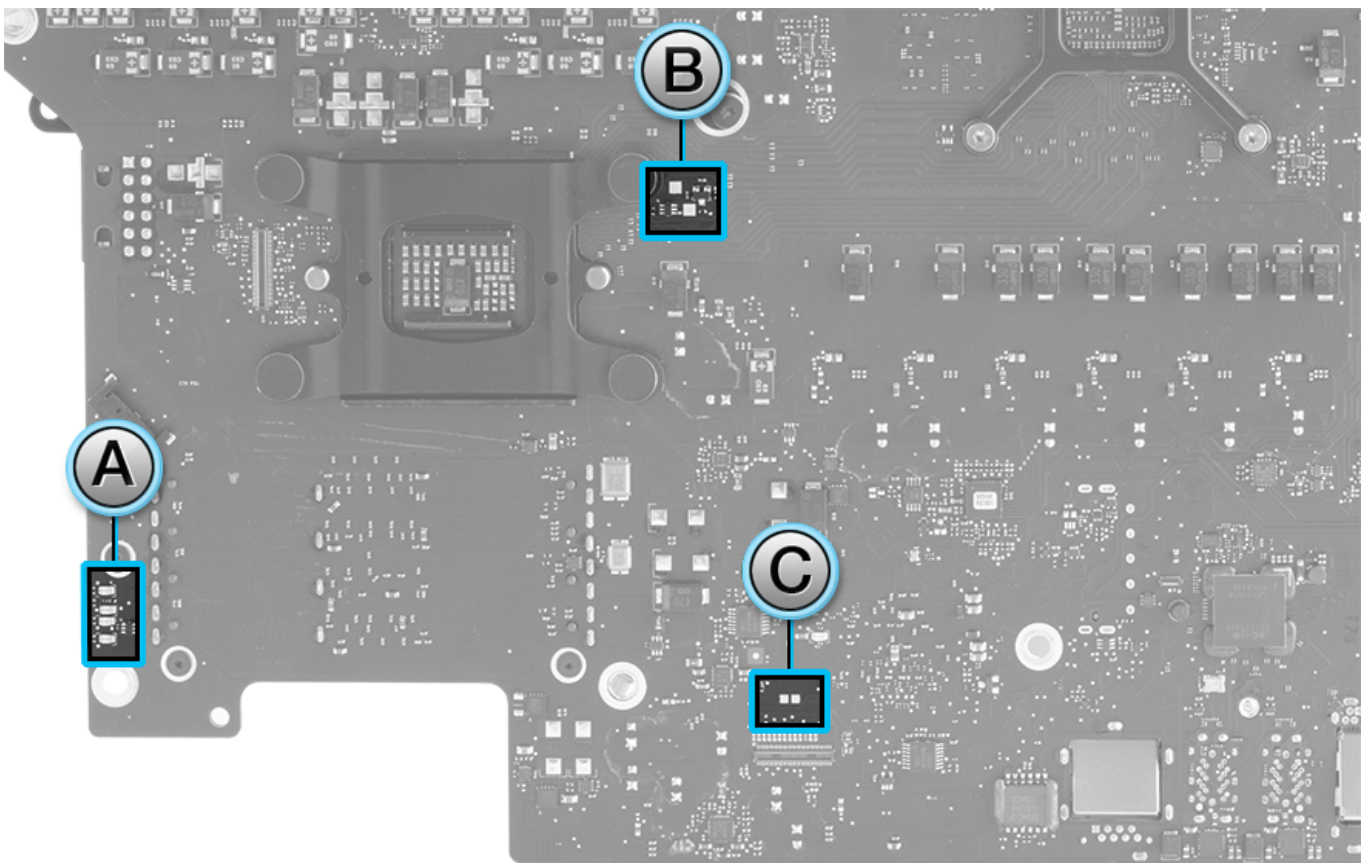
- Shut down and unplug the iMac. Allow approximately two minutes for the power supply to discharge.
- Measure the coin battery voltage by using a voltmeter set for DC. Place the probes on the pads (negative probe on left pad, positive probe on right pad) in location B, shown below. If the voltage is 2.7 volts DC or less, then the coin battery should be replaced.

C. Real-Time Clock (RTC) Reset Pads

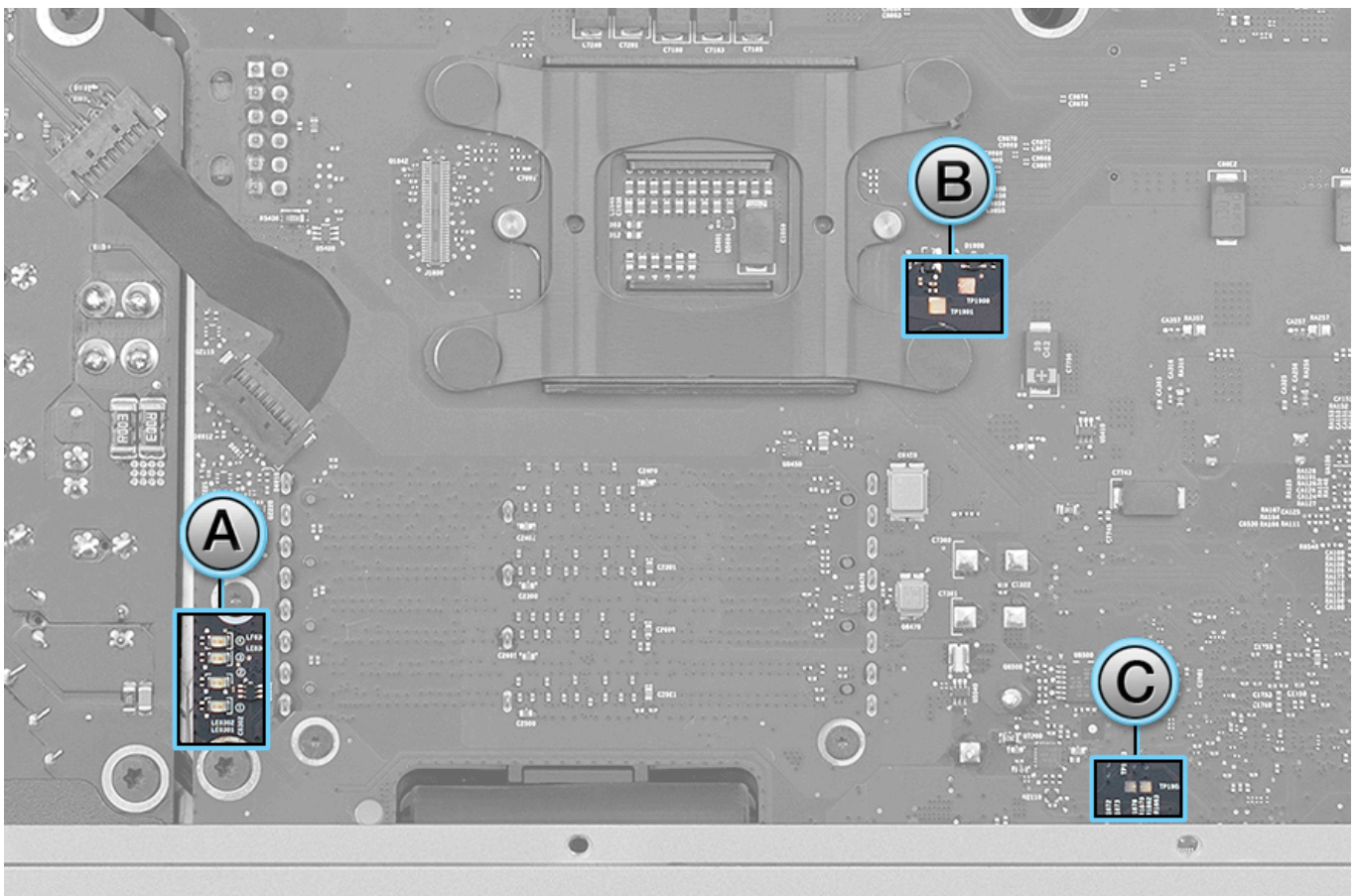
Caution: Do not make contact with any of the surrounding components or traces while performing this procedure. Some of the smaller components can be broken off very easily. Physically damaged boards warrant a logic board replacement.

- Shut down and unplug the iMac. Allow approximately two minutes for the power supply to discharge.
- Reset the RTC by shorting the pads in location C, shown below. Use the tip of a flat-blade screwdriver to touch both pads at the same time.

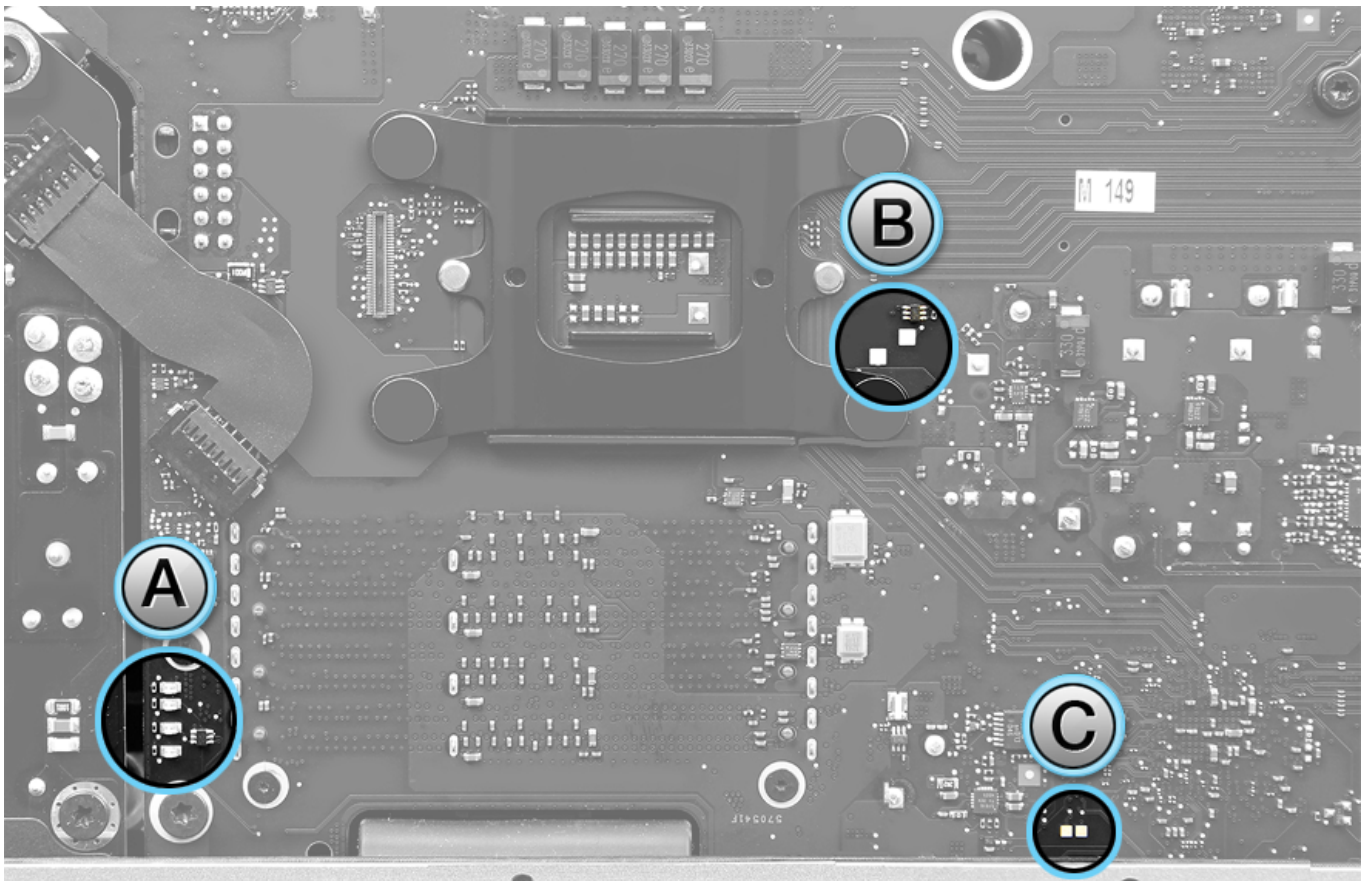
iMac (Retina 5K, 27-inch, Late 2015) LEDs and Test Pads



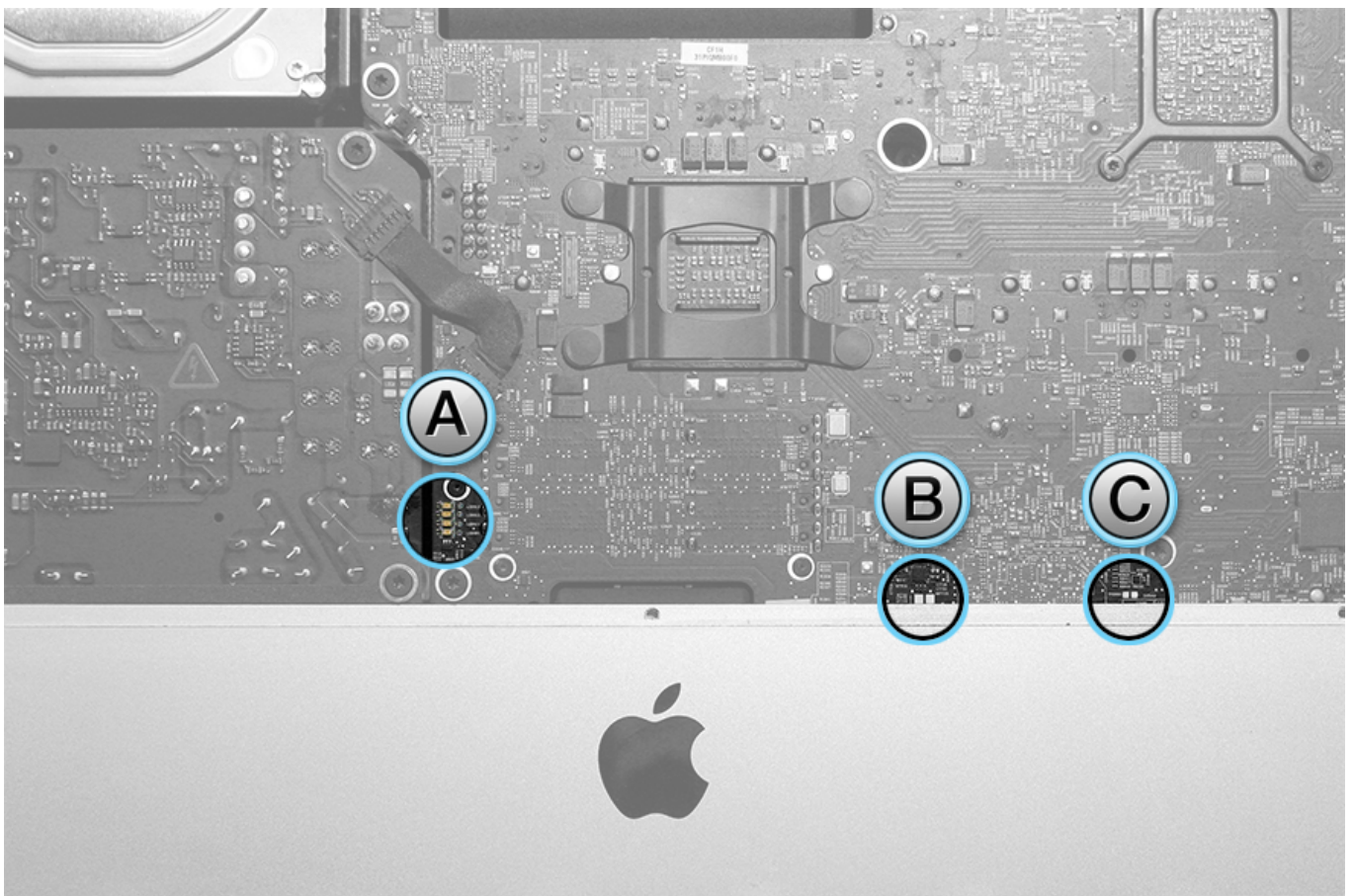
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) LEDs and Test Pads



iMac (27-inch, Late 2013) LEDs and Test Pads



iMac (27-inch, Late 2012) LEDs and Test Pads



Diagnostic LEDs (A)

LED 1

- Indicates that the trickle voltage from the power supply has been detected by the main logic board. This LED will turn

on when you connect the iMac to a working AC power source. The LED will remain on as long as the computer is on or asleep.

- When the computer has been shut down correctly, LED 1 behavior may differ:
 - If a startup event is scheduled in System Preferences/Energy Saver, then LED 1 will stay on after a correct shutdown.
 - If no startup event is scheduled in System Preferences/Energy Saver, then LED 1 will turn off and will stay off as long as the power cord is kept connected and an AC power source is present. Disconnecting the power cord and plugging it back in will turn this LED back on, even if the computer is still off.
- After disconnecting and reconnecting the AC power source, this LED could remain off:
 - If the AC power source is missing or disconnected.
 - If the logic board is disconnected from the power supply or the AC receptacle.
 - If the power supply board is faulty.

LED 2

- Indicates that the computer is turned on. This LED will be on as long as the computer is turned on (but is not asleep) and the power supply and voltage regulators are working correctly.

LED 3

- Indicates that the computer and video card are communicating. This LED will be on when the computer is communicating properly with the video card. If LEDs 1 and 2 are on and you heard the startup sound, but LED 3 is off, then the backup battery (on the back of the logic board) may need to be reseated or the video card might be installed incorrectly or need replacement.

LED 4

- Indicates that the computer and LCD panel are communicating. This LED will be ON when the computer is turned on and a video signal is being generated. If LED 4 is on and there is no image on the display, then the LCD panel or the cables between the LCD and logic board might be installed incorrectly or need replacement.

LED Startup Sequence

LED 1 = Power is available.

If no LED is visible:

- Disconnect the power cord from the computer and wait 15 seconds to reset the power supply and LED status. Reconnect the power cord and check the LED status again.
- Verify the AC source.
- Verify that a known-good power cord is connected.
- Verify the cable connection between the AC inlet and the power supply.
- Verify the cable connection between the power supply and the logic board.
- Verify the power supply.

LED 1 + LED 2 = Power is available and the system is turned on.

If the second LED is not visible when the power button is pressed:

- Verify that the power button is connected to the power supply.
- Verify power button functionality.
- Verify the cable connection between the power supply and the logic board.
- Verify the power supply.
- Verify the logic board.

LED 1 + LED 2 + LED 3 = Power is available, the system is turned on, and the GPU was found.

If the third LED is not visible after the system is turned on:

- Verify whether the boot chime is present and fans are running when turned on (reset the SMC and PRAM and verify backup battery voltage for proper startup).
 - If the POST boot chime is not heard, go to the No Startup symptom flow.
 - If the POST boot chime is heard, go to the No Video symptom flow.

LED 1 + LED 2 + LED 3 + LED 4 = Power is available, the system is turned on, the logic board is communicating with the GPU, and the internal LCD was found.

If the fourth LED is not visible after the system is turned on:

- Verify the internal DisplayPort cable (eDP) connections between the LCD panel and the logic board.

- Inspect the LCD display cables for cable damage.
- Verify external video functionality and proceed according to the result:
 - If an external display works, verify/replace the LCD panel.
 - If an external display does not work, verify/replace the logic board.

Testing the Panel Using the Display Extension Cable Kit

Testing the Panel Using the Display Extension Cable Kit for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

Use the display extension cable kit to:

- Test the system and/or panel before securing the panel to the very high bond (VHB) adhesive strips.
- Test the functionality of the panel's Embedded DisplayPort (eDP) cable.



Warning: HIGH VOLTAGE. Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in, because the power supply retains a charge whether or not the computer is on.

After unplugging the computer from the electrical outlet, wait two minutes before removing the display panel, disconnecting modules, or substituting cables and components. This will allow the power supply and logic board time to discharge.

- Never remove or install any physical components while the computer is plugged in to an electrical outlet.
- When the computer is plugged in, the power supply and logic board are energized, even when the computer is turned off.
- Unplug the computer and, when possible, allow sufficient time for the power supply and logic board to self-discharge before removing the display panel.
- Do NOT touch the logic board or the power supply while the computer is plugged in, or before sufficient time has passed to discharge stored voltage to a safe level after being unplugged.

Refer to the following articles for more safety information:

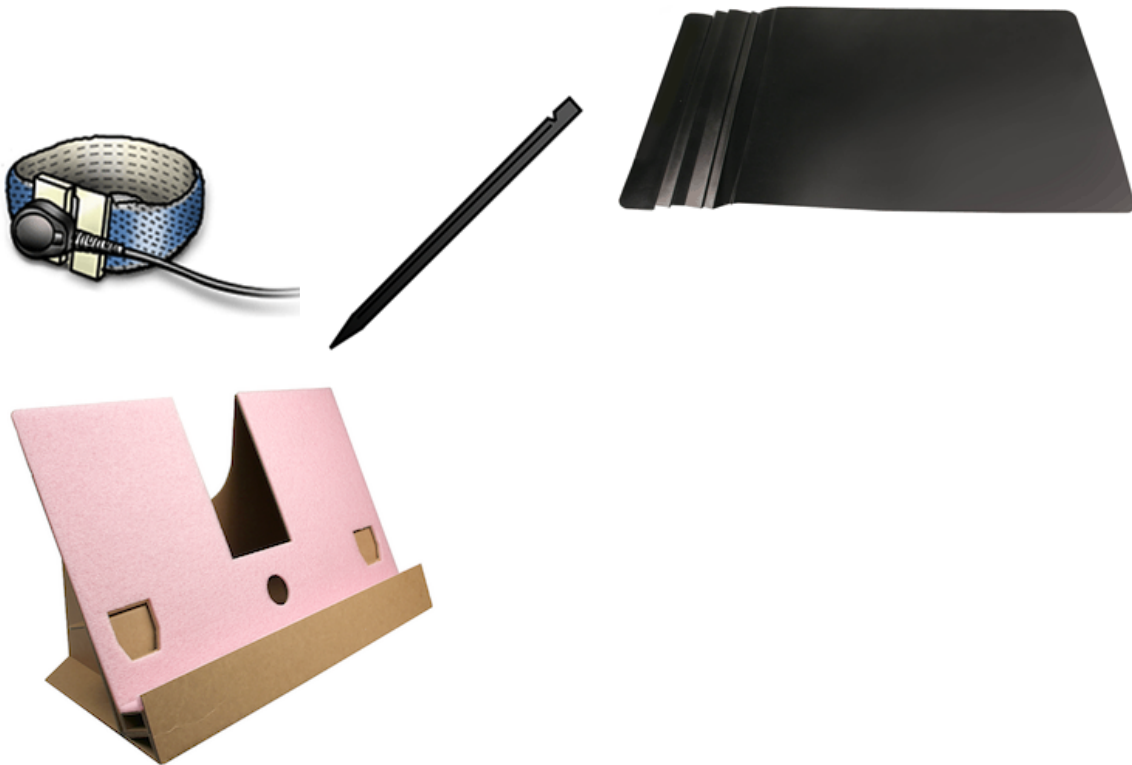
- [TP833: iMac and Displays: Power Supply Cover Instructions](#)
- [TP820: iMac \(27-inch\): Safety](#)



Tools

- ESD wrist strap and mat
- Black stick
- Power supply protective covers, pack of 2 (923-0189)
- LCD service support stand, iMac (923-0416)
- Kit, display extension cable set (076-1431) for iMac (27-inch, Late 2012 and Late 2013)

- Kit, display extension cable set (076-00010) for iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)
- Painter's tape



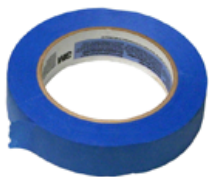
eDP Extension Cable



BLC Extension Cable



eDP Substitution Cable



Note: The iMac (27-inch, Late 2013) display and extension cable kit are shown for the procedures. Follow the same setup steps and procedures if testing the iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) display, but use Display Extension Cable Set Kit 076-00010.

Procedure #1: Testing the System With the Panel Off, Using Extension Cables

This procedure allows you to test the system with the panel off, to ensure that everything is functioning before securing the panel with VHB strips.

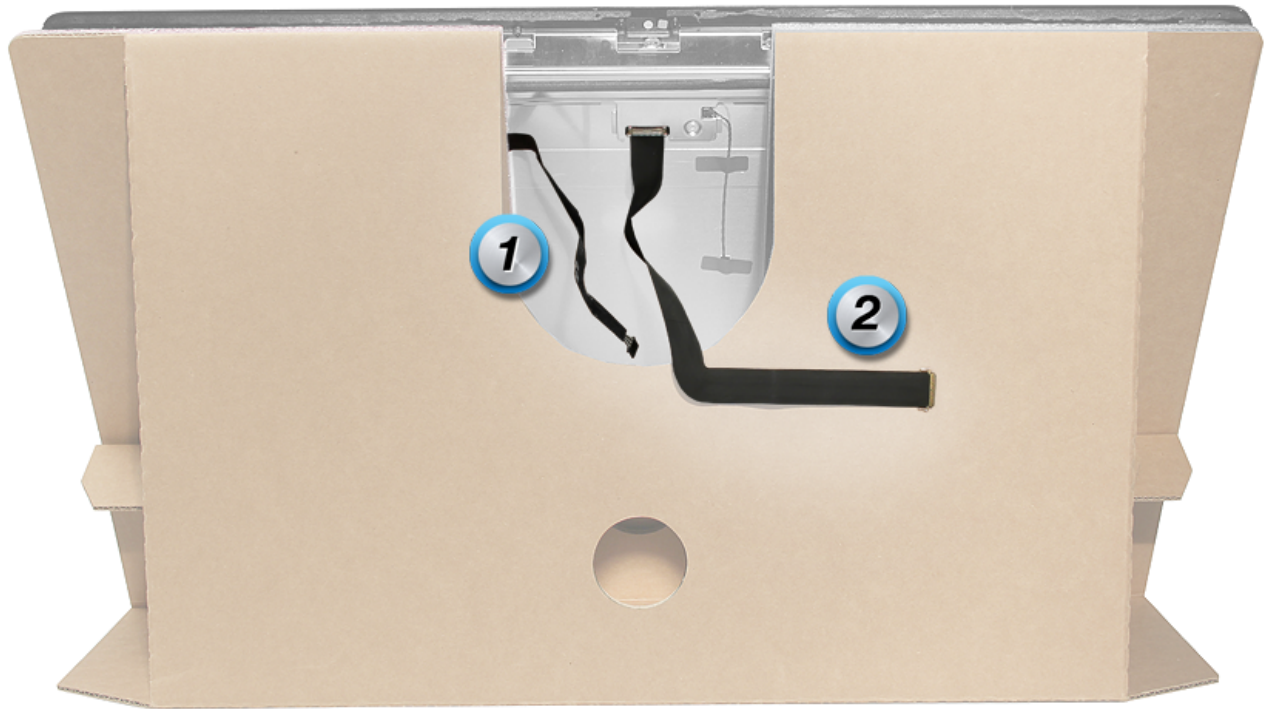
First Steps

- [Display panel removal](#)
- [Display panel - removing very high bond \(VHB\) strips](#)

1. Place the LCD panel on the service support stand.



2. Orient the service support stand so the LCD backlight cable (#1) and eDP (#2) cable are facing you.

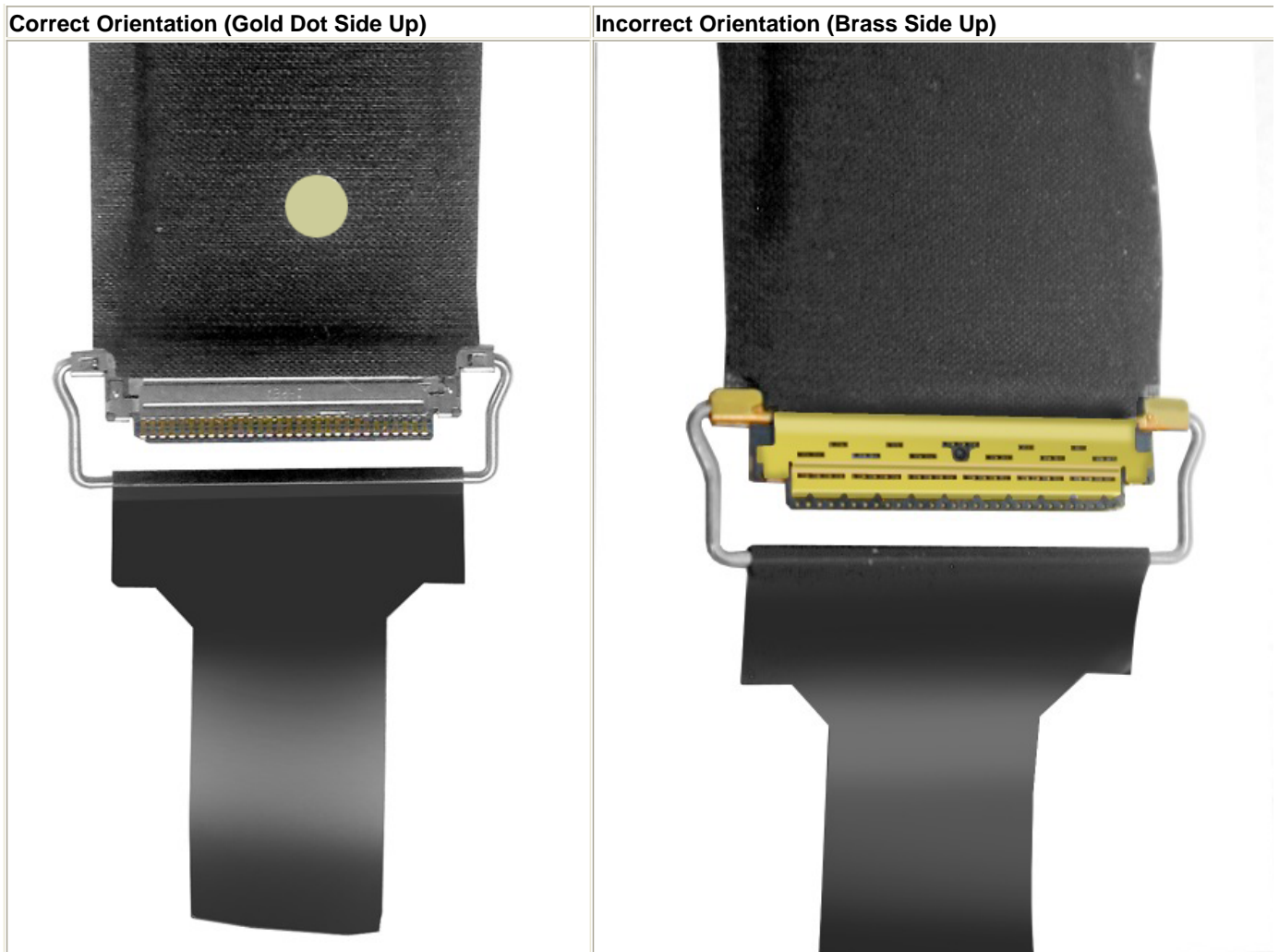


3. Locate the eDP extension cable in the kit.

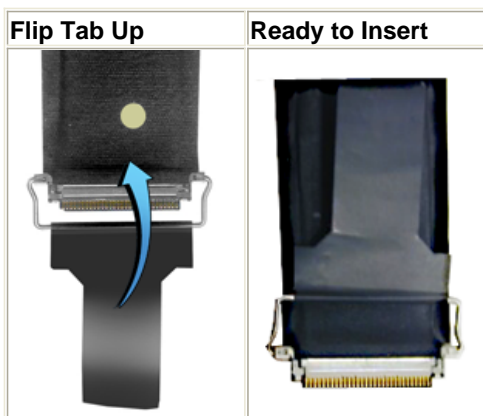


4. **Important:** Each end of the eDP extension cable has a gold dot to indicate cable orientation. Orient the cable with the gold dot side up when connecting the eDP extension cable to the logic board connector and the end of the LCD eDP cable. Connecting cables upside down (with the brass connector facing up) will damage the logic board and/or the LCD panel.

Note: With proper care, cables will last for approximately 50 insertions. After 50 insertions, cable degradation may occur and Apple recommends ordering a new Display Extension/Substitution Cable Kit (refer to the Tools section above).



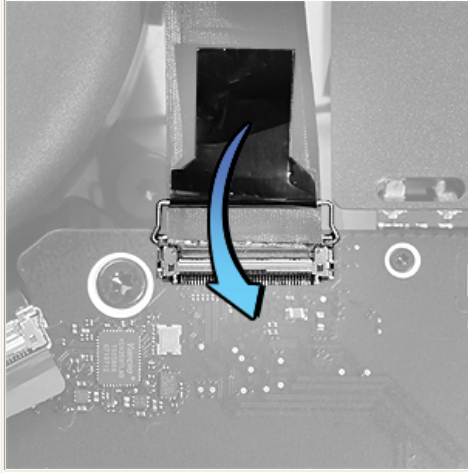
5. Flip the black tab up before connecting the eDP extension cable to the logic board connector.



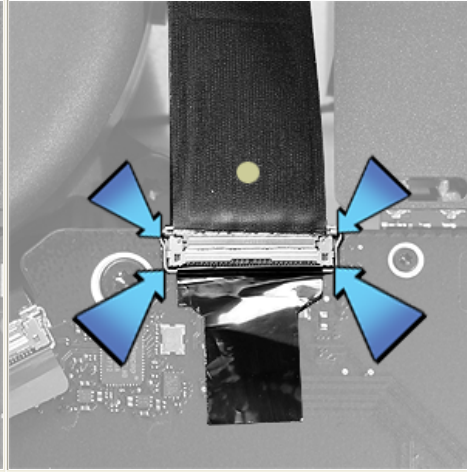
6. Connect the extension cable to the logic board connector. The cable should be aligned straight on with the connector, never inserted at an angle. **Important:** Ensure that the black tab is attached to the locking lever on the eDP cable. Attaching the locking lever without the black tab may cause damage to the logic board and/or the LCD panel.

- Verify that both ends of the cable have the gold dot side facing up.
- Check that the connector is fully seated.
- Flip the black tab down.
- Press the locking lever to secure the cable to the logic board.

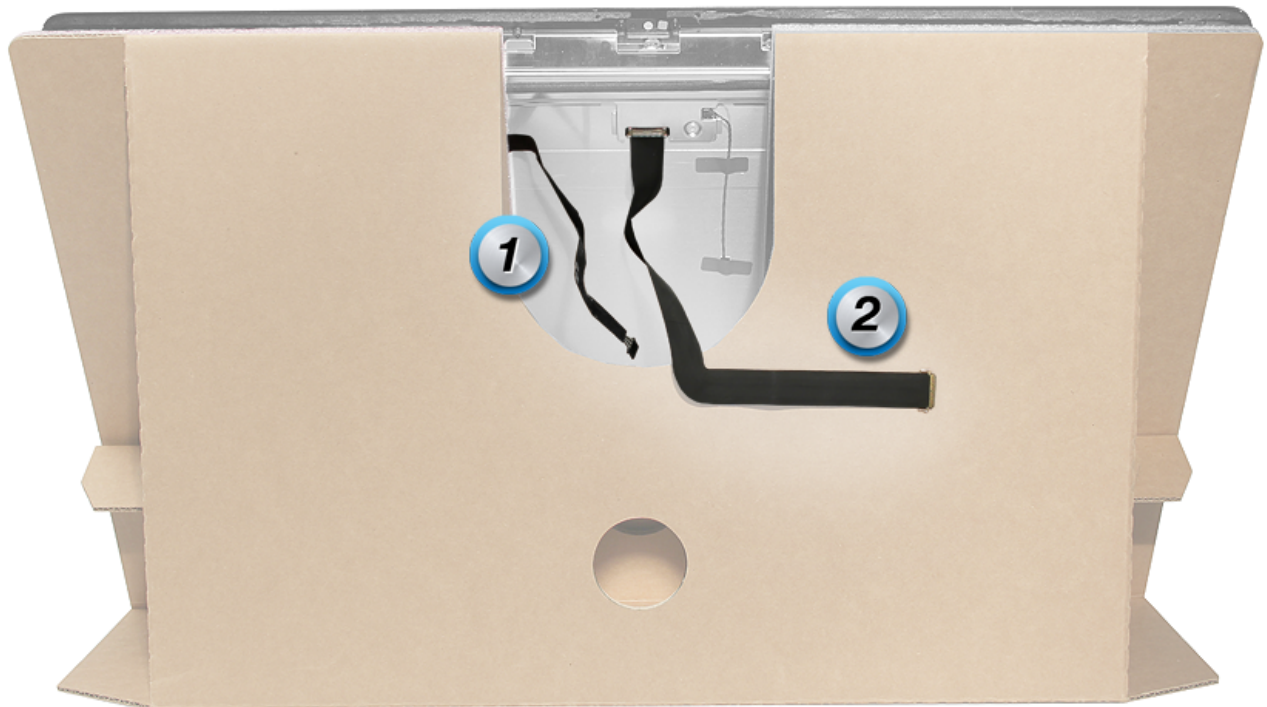
Flip Tab Down



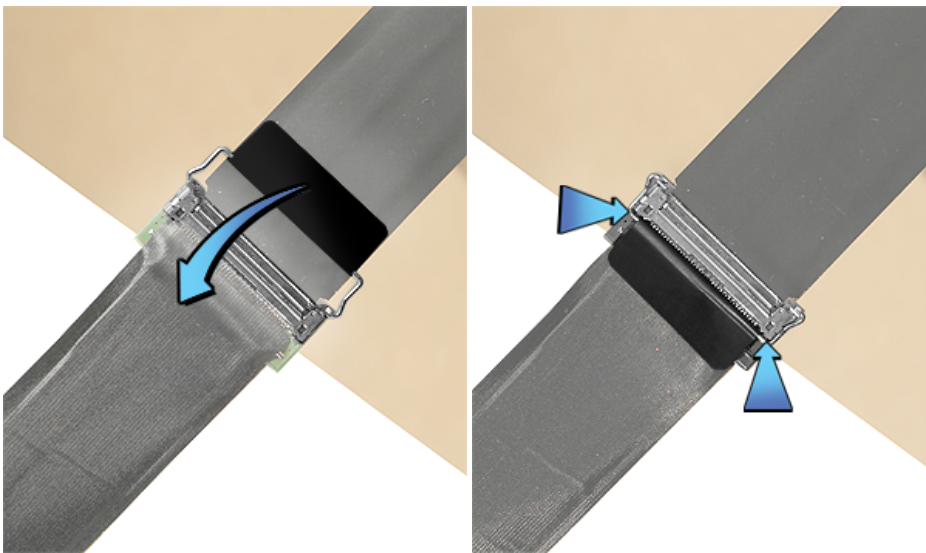
Press Locking Lever to Secure Connector



7. Secure the logic board end of the eDP extension cable to the speaker with painter's tape (see step 10).
8. Connect the other end of the eDP extension cable to the end of the dangling DisplayPort cable (#2).



9. Securely mate the cable connectors. Flip the black tab over and press the locking lever bar around the connector to secure the cables.



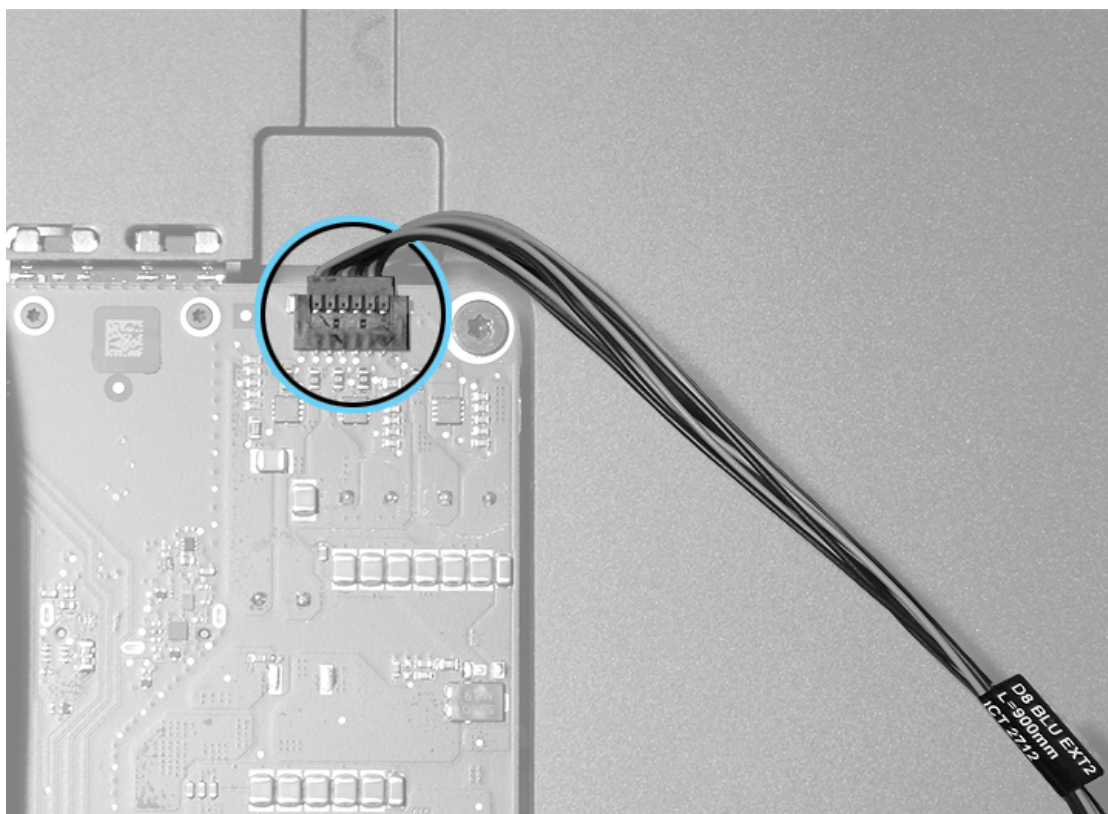
10. The eDP extension cable will look like the image below when connected properly.



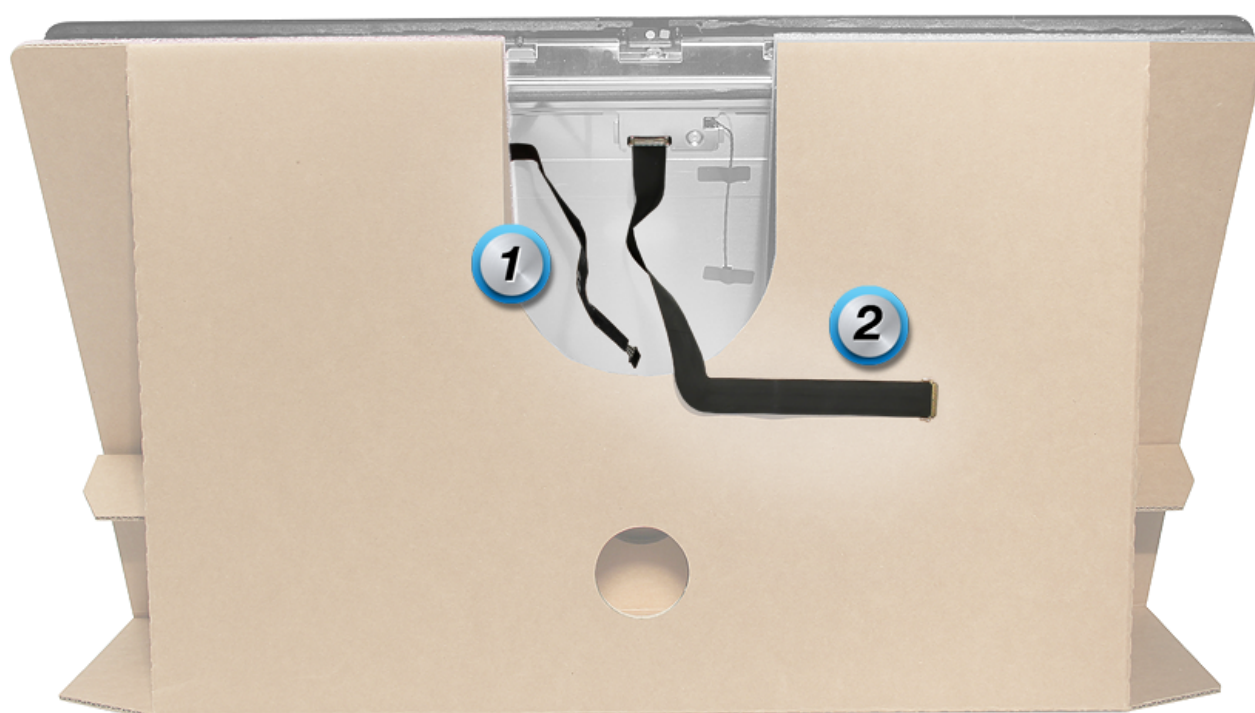
11. Next, locate the backlight extension (BLC) cable.



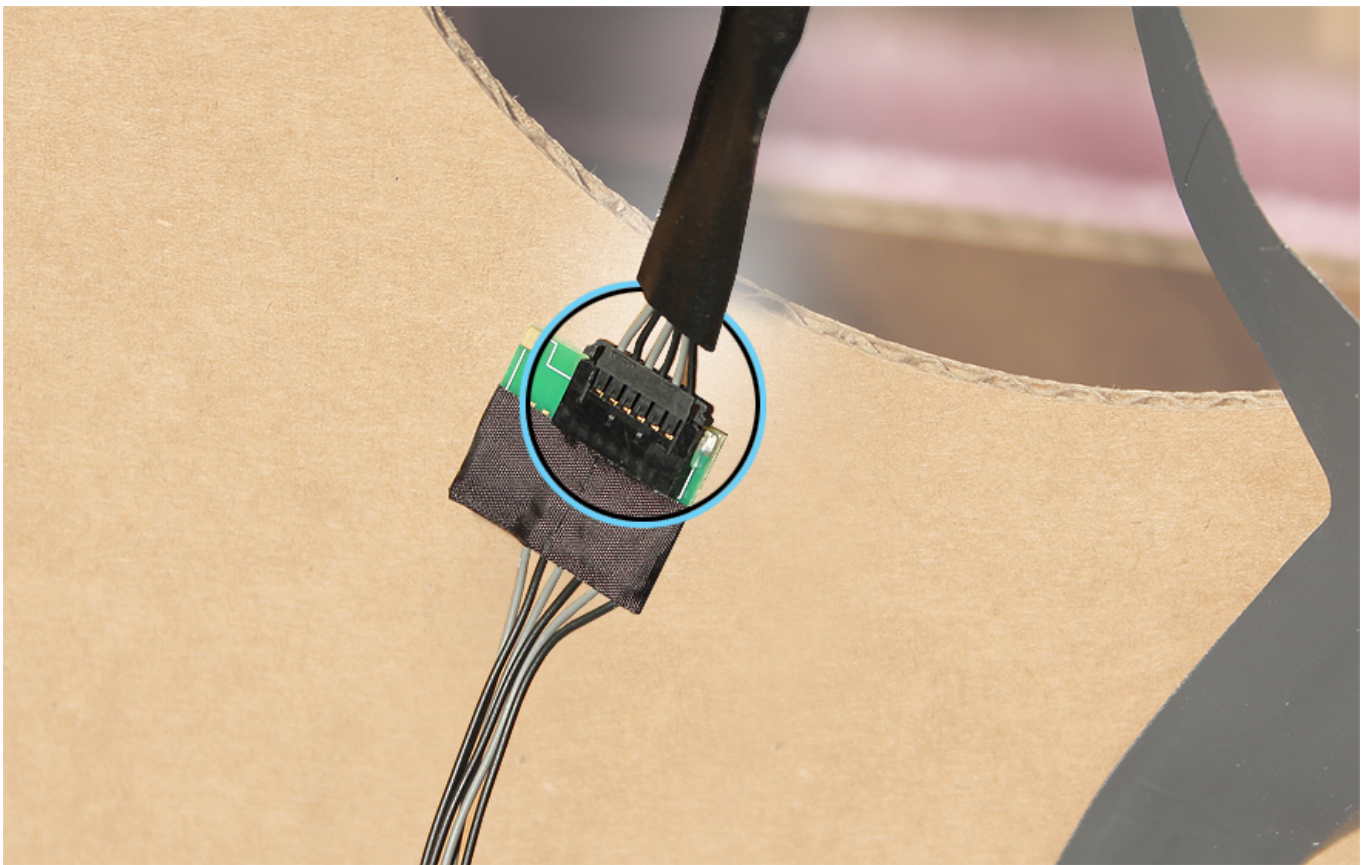
12. Connect the backlight extension cable to the backlight connector on the logic board.



13. Connect the other end of the backlight extension cable to the dangling end of the LCD backlight cable (#1).



14. Securely mate the backlight extension cable with the panel's backlight cable connector.



15. Locate the two power supply covers. Position one horizontally over the power supply and one vertically over the logic board and cables. Tape the power supply covers securely to the rear housing. Proper eDP and backlight extension cable setup is shown below.



16. Attach the power cord to the iMac and start up the system to verify system functionality.
Procedure #2: Testing the Panel with the eDP Substitution Cable;

This procedure tests an eDP cable to determine whether the issue is with the eDP cable. Remove the “suspect” eDP cable from the circuit and replace it with the eDP substitution cable.

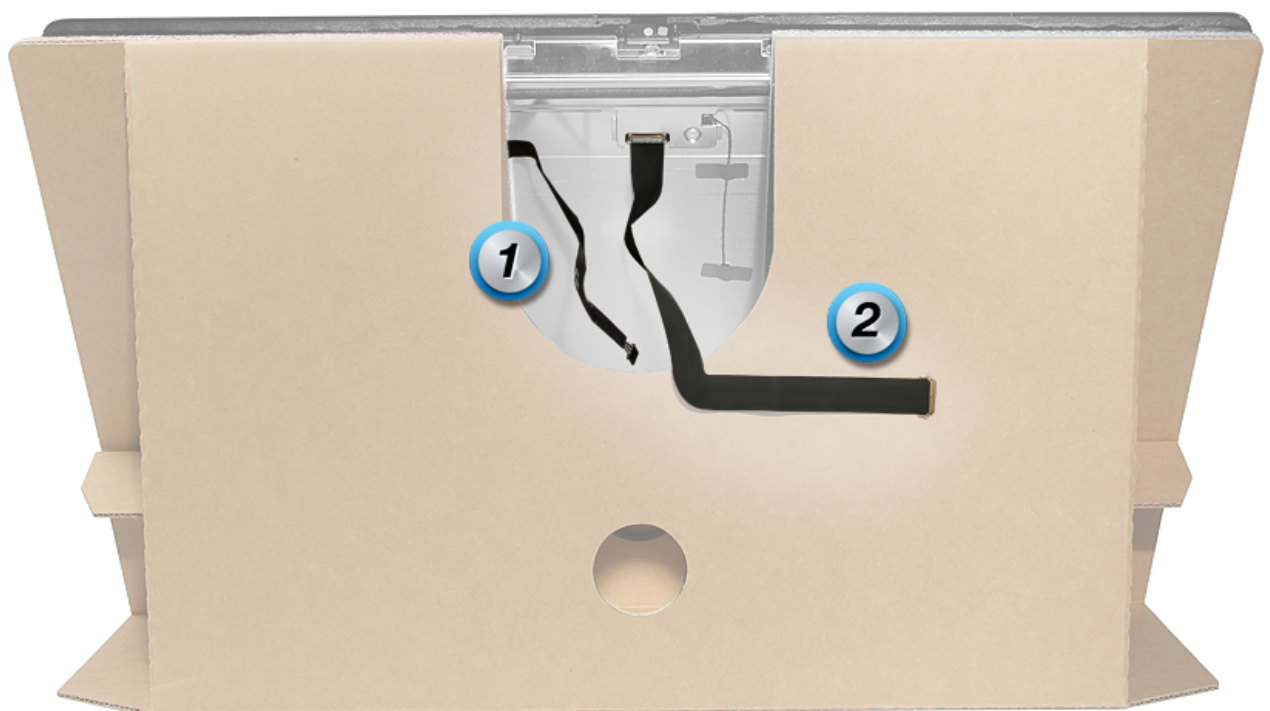
First Steps

- [Display panel removal](#)
- [Display panel - removing very high bond \(VHB\) strips](#)

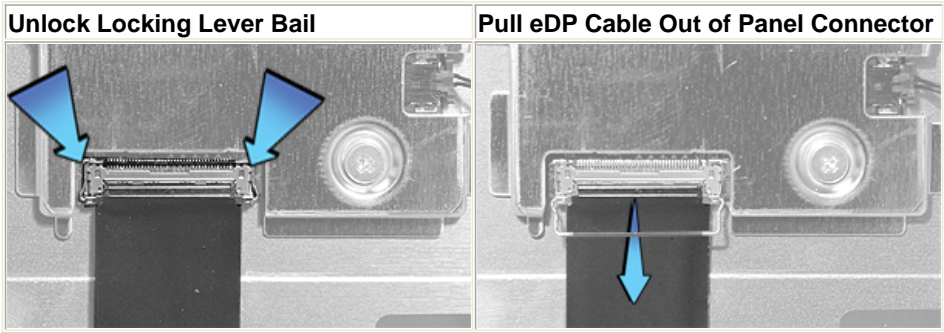
1. Place the LCD panel on the service support stand.



2. Orient the service support stand so the backlight cable (#1) and eDP (#2) cable are facing you.



3. Disconnect the eDP cable from the connector on the LCD panel. Use your fingernail to flip the locking lever bail.



4. Locate the eDP substitution cable.



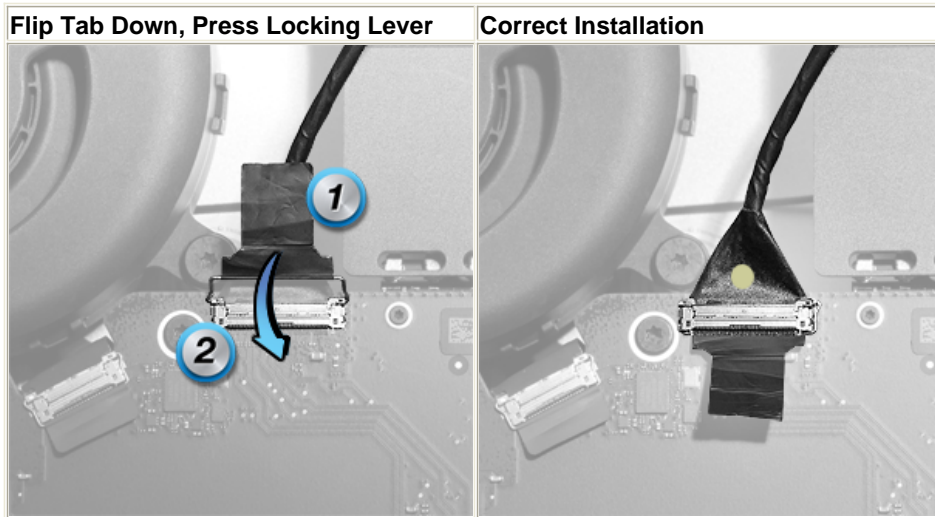
5. Either end of the cable can connect to the logic board; the other end connects to the display. **Important:** Each end of the eDP substitution cable has a gold dot to indicate the cable orientation. Orient the cable with the gold dot side up when connecting the eDP substitution cable to the logic board and to the connector on the LCD panel. Connecting the cable upside down (with the brass connector facing you) will damage the logic board and/or the LCD panel.

Note: With proper care, cables will last for approximately 50 insertions. After 50 insertions, cable degradation may occur and Apple recommends ordering a new Display Extension/Substitution Cable Kit (refer to the Tools section above).



6. Connect one end of the eDP substitution cable to the connector on the logic board. The cable should be aligned straight on with the connector, never inserted at an angle. The eDP substitution cable is shown properly connected to the logic board. **Important:** Ensure that the black tab is attached to the locking lever on the eDP cable. Attaching the locking lever without the black tab may cause damage to the logic board and/or the LCD panel.

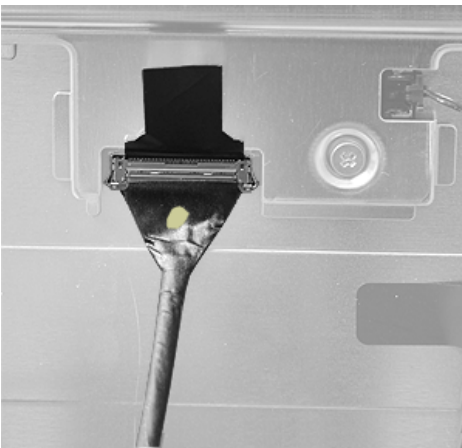
- a. Verify that each end of the cable has the gold dot side facing up.
- b. Check that the connector is fully seated.
- c. Flip the black tab down (#1).
- d. Press the locking lever (#2) to secure the cable to the logic board.



7. Connect the other end of the eDP substitution cable to the eDP connector on the back of the LCD panel.



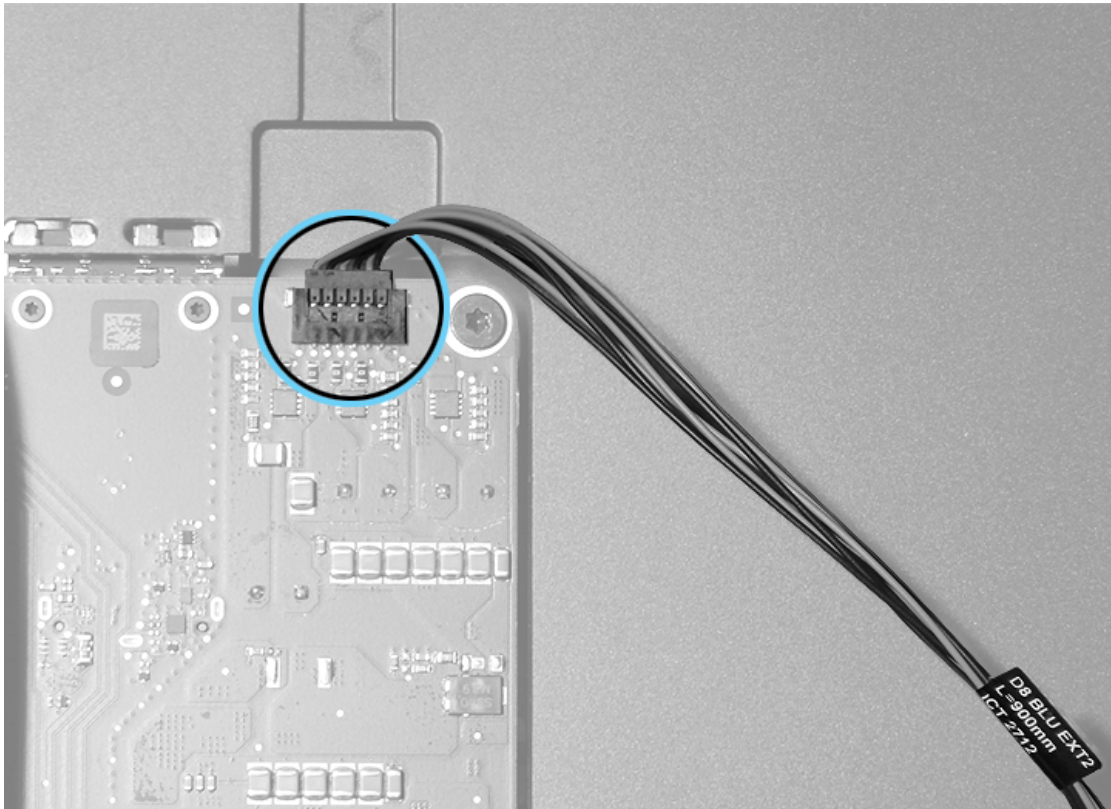
8. Flip the black tab up and press the locking lever bar securely around the connector on the panel.



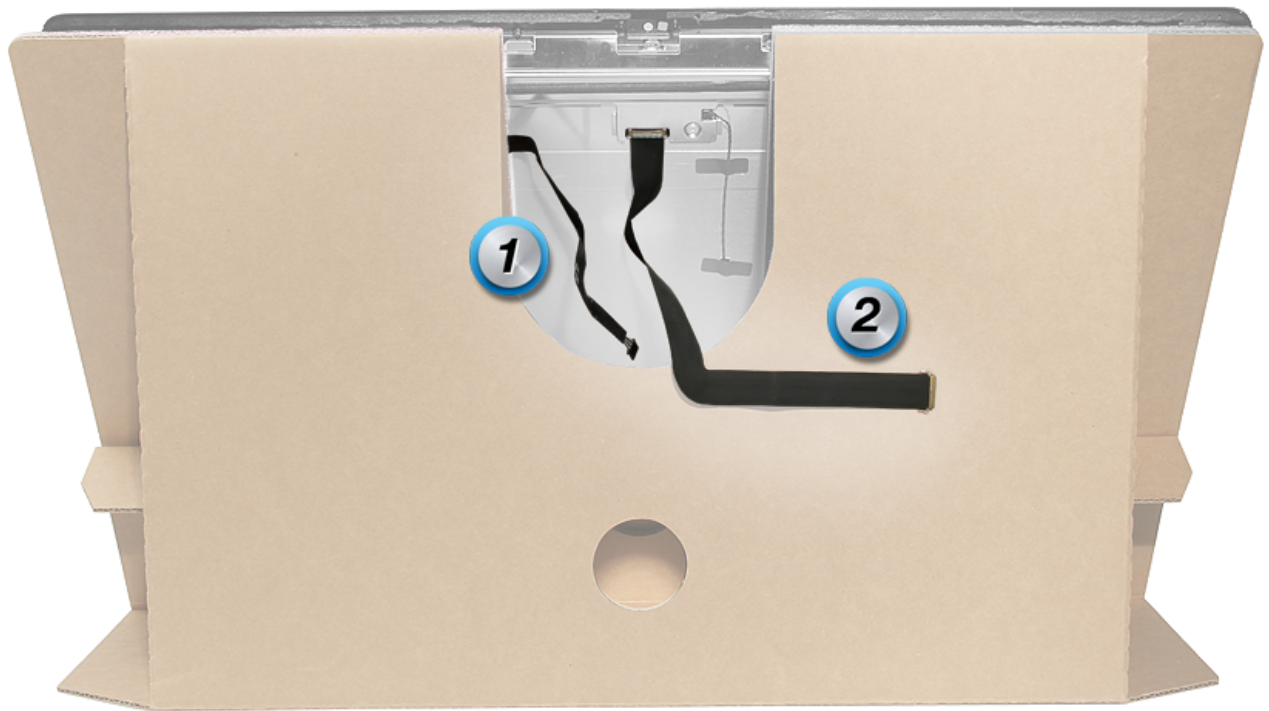
9. Next, locate the backlight extension (BLC) cable.



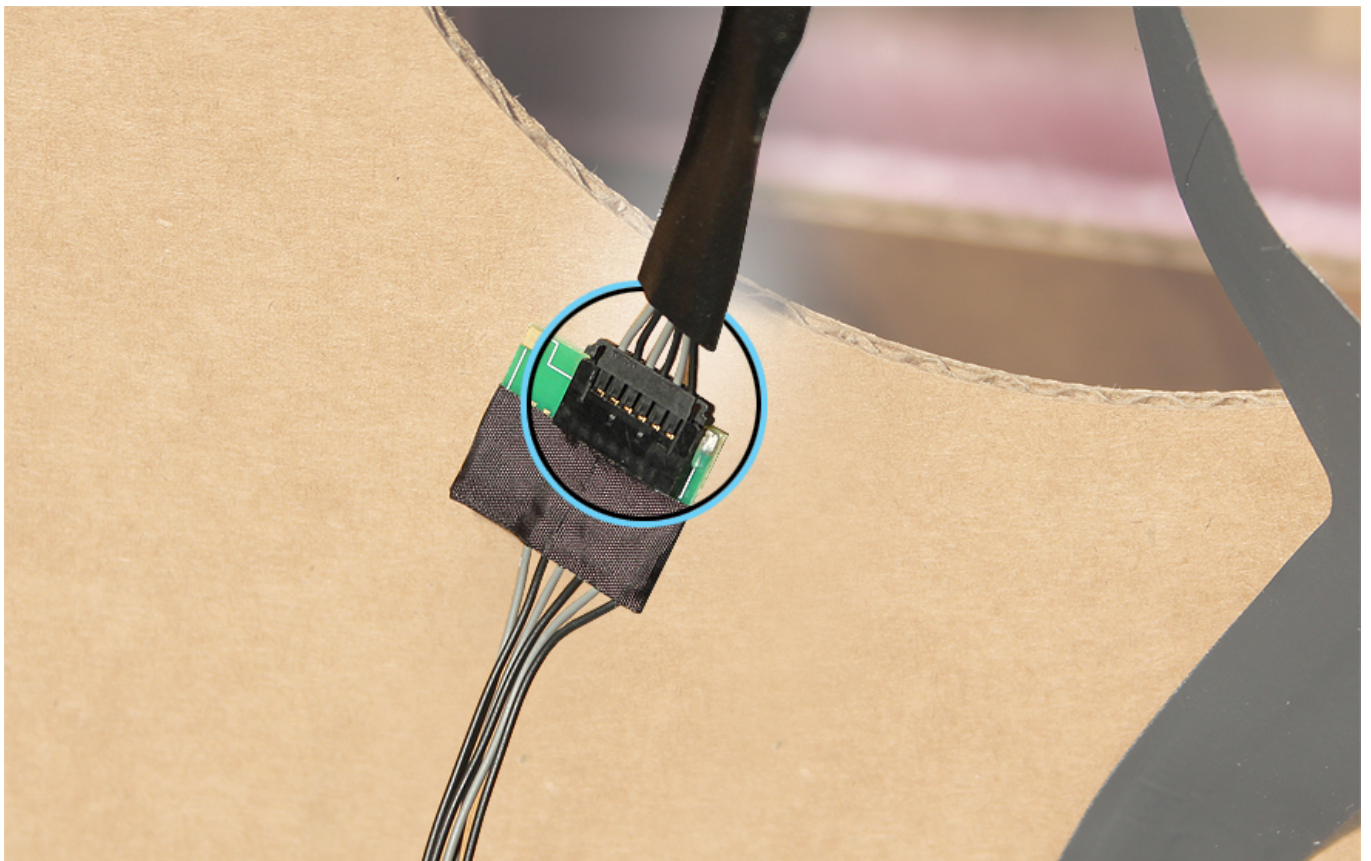
10. Connect the backlight extension cable to the backlight connector on the logic board.



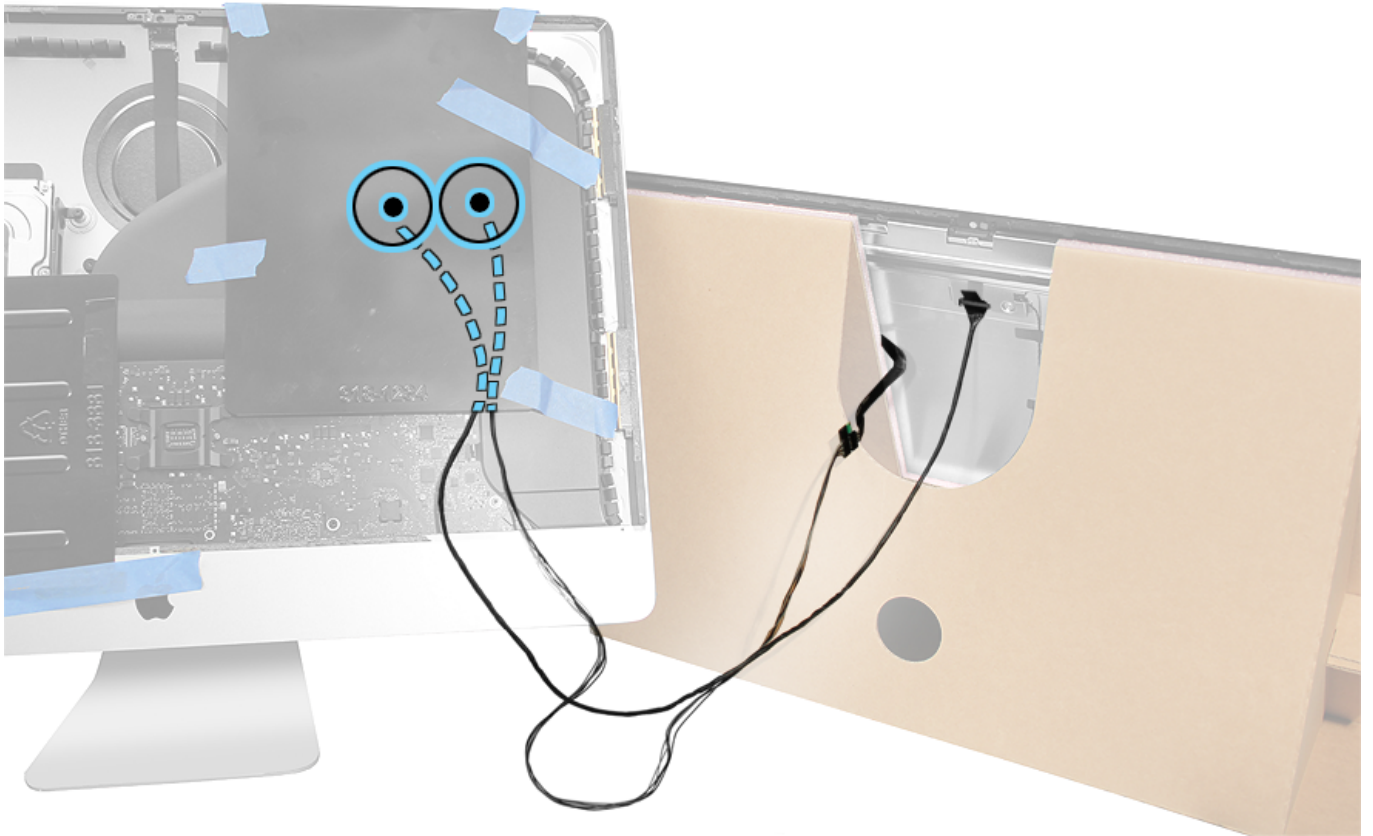
11. Connect the other end of the backlight extension cable to the dangling end of the LCD backlight cable (#1).



12. Securely mate the backlight extension cable with the panel's backlight cable connector.



13. Locate the two power supply covers. Position one horizontally over the power supply and one vertically over the logic board and cables. Tape the power supply covers securely to the rear housing. The image below shows the proper cable setup for the eDP substitution cable and the backlight extension cable.



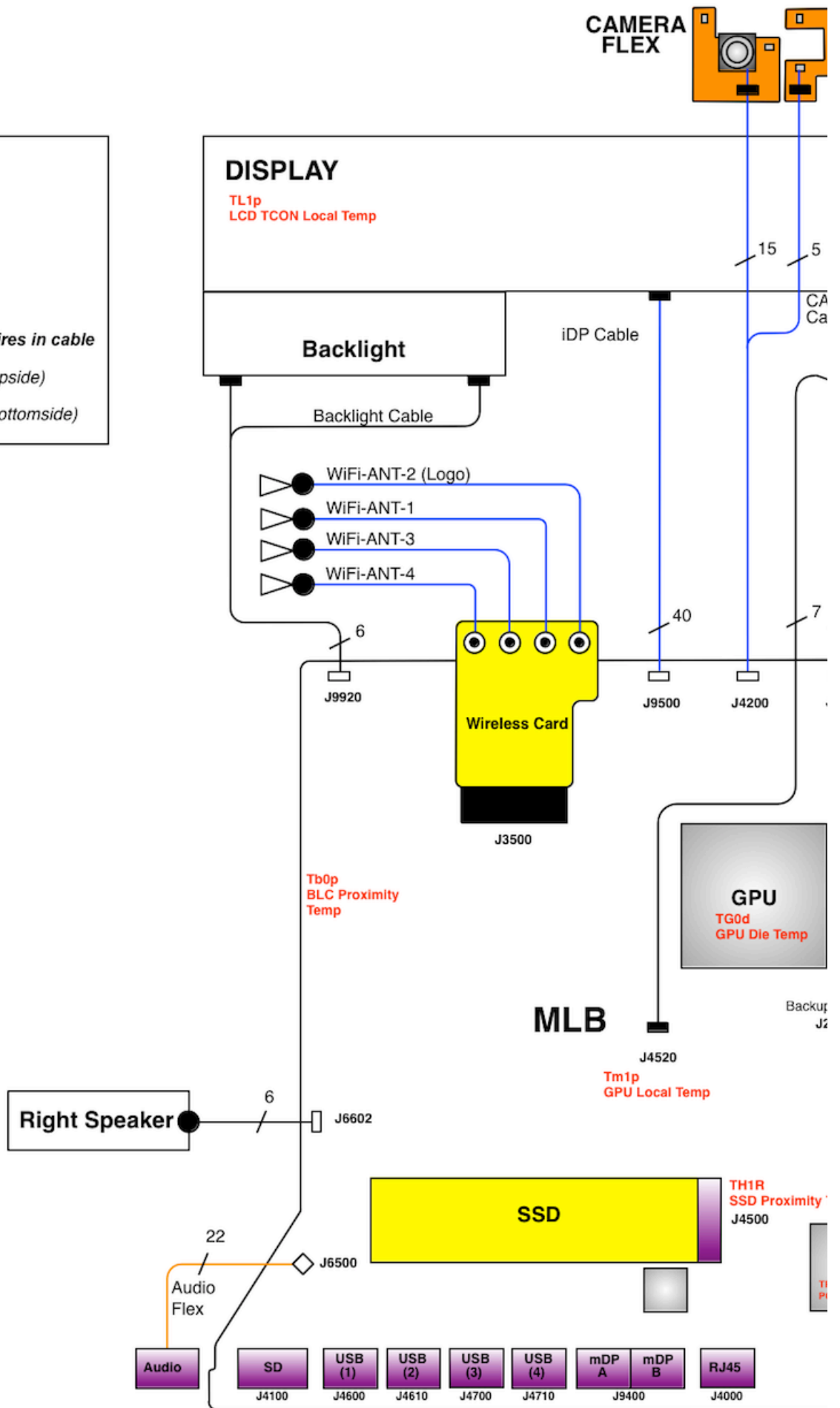
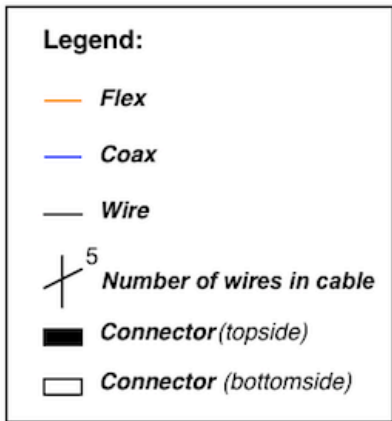
14. Attach the power cord to the iMac and start up the system to verify eDP cable functionality.

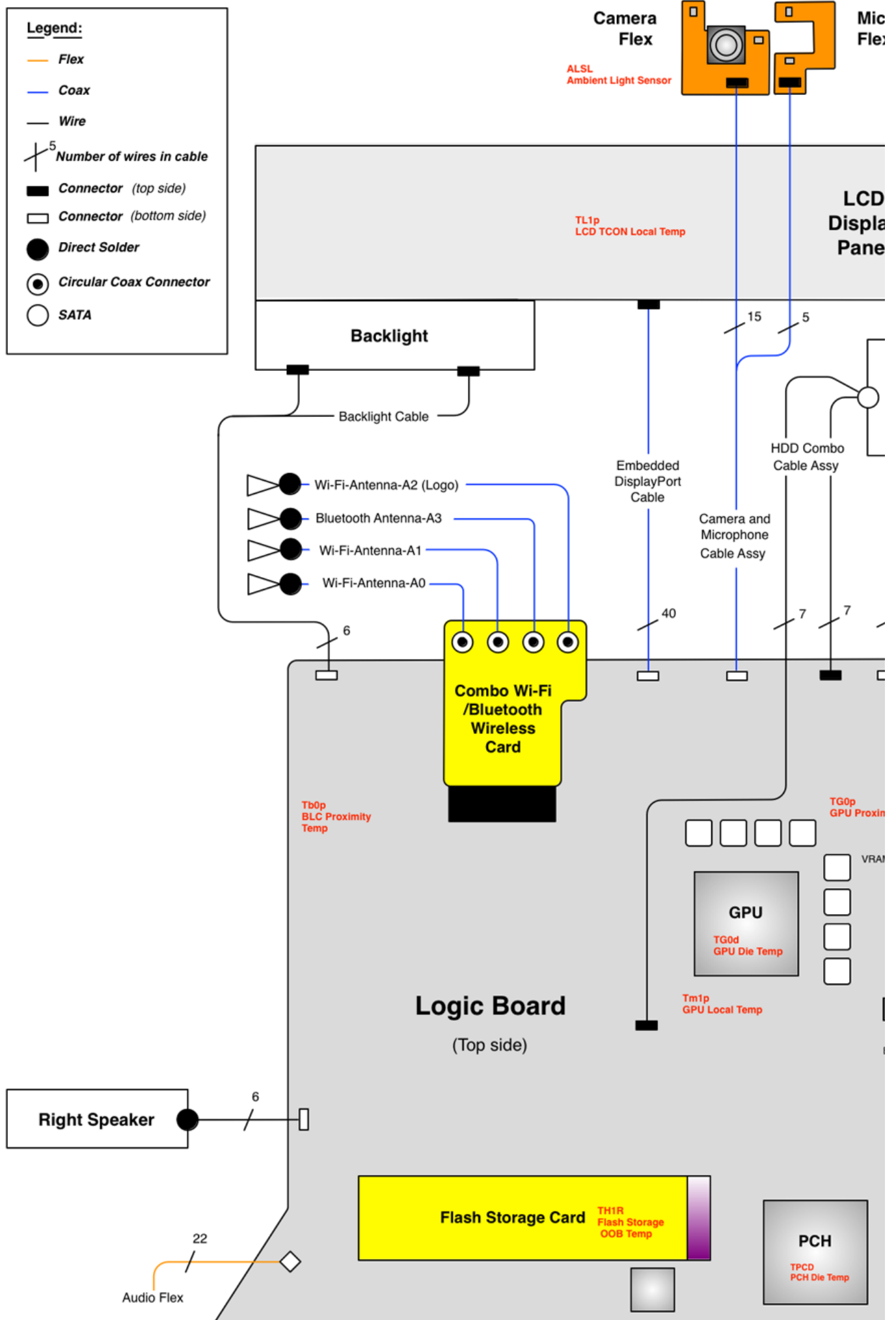
Interconnect Diagram

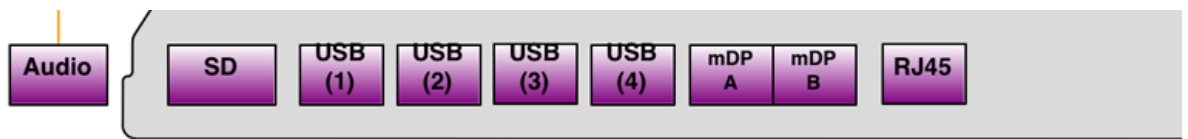
Interconnect Diagram for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

Thermal sensors and cable connector locations are shown below.

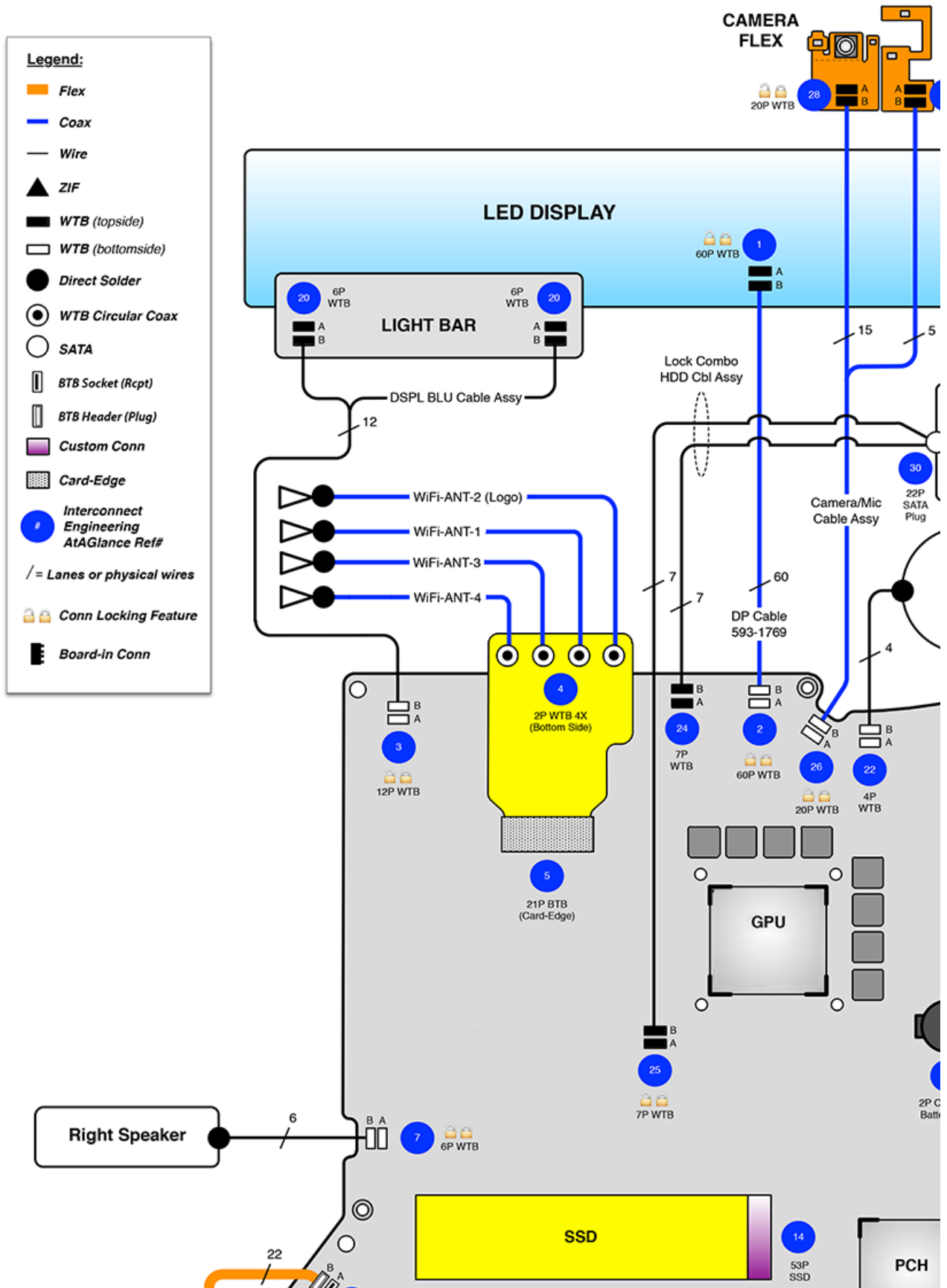
iMac (27-inch, Late 2012)

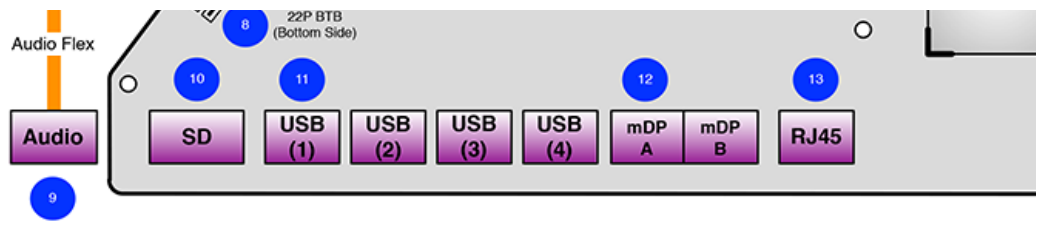






iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)





Interconnect Diagram

Interconnect Diagram for iMac (Retina 5K, 27-inch, Late 2015)

Thermal sensors and cable connector locations are shown below.

Legend:

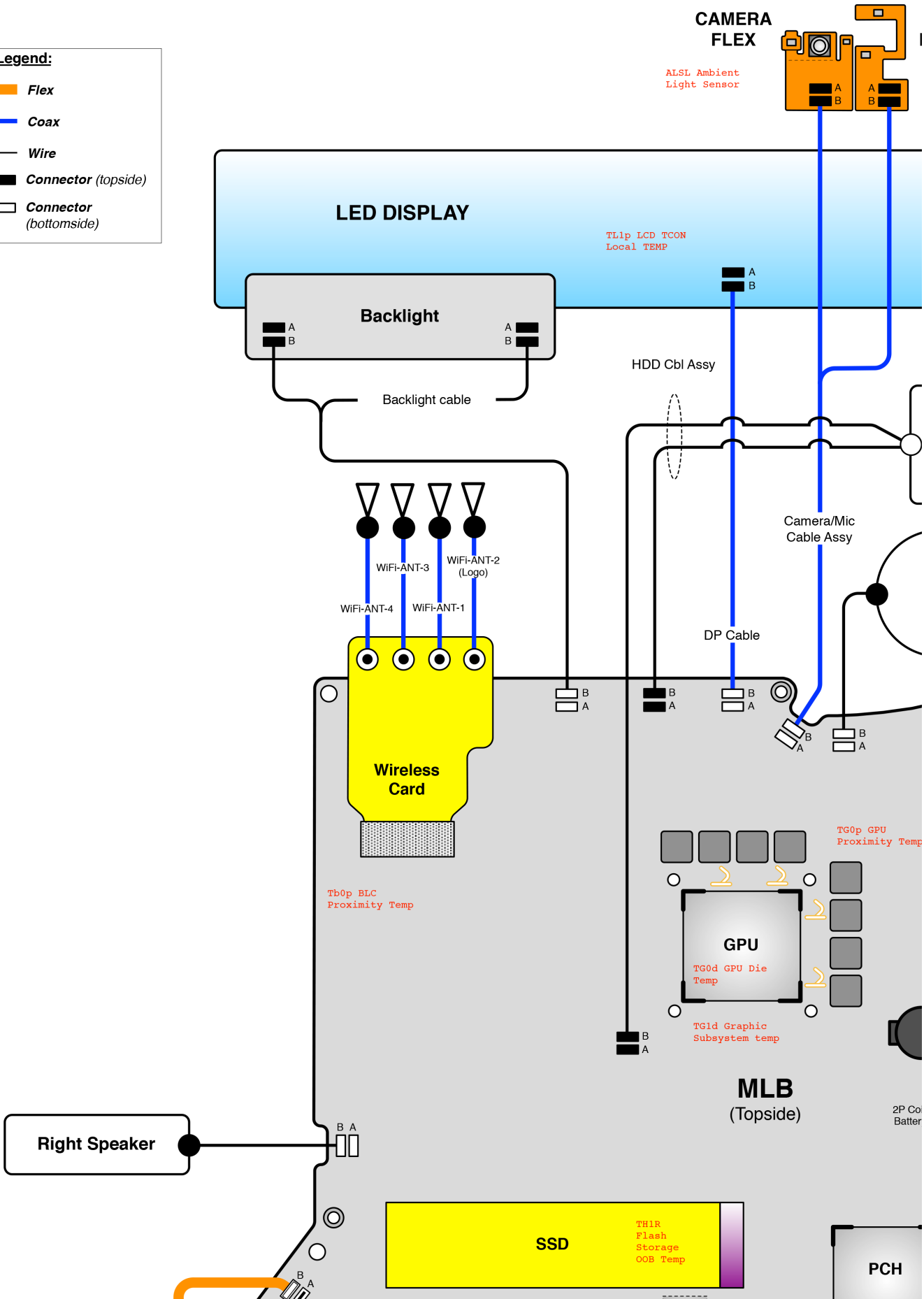
Flex

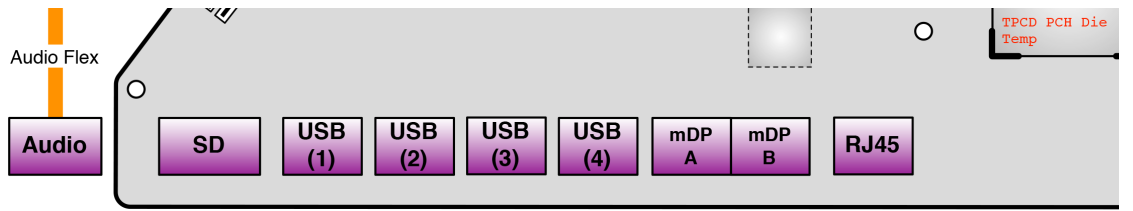
Coax

Wire

Connector (topside)

Connector (bottomside)



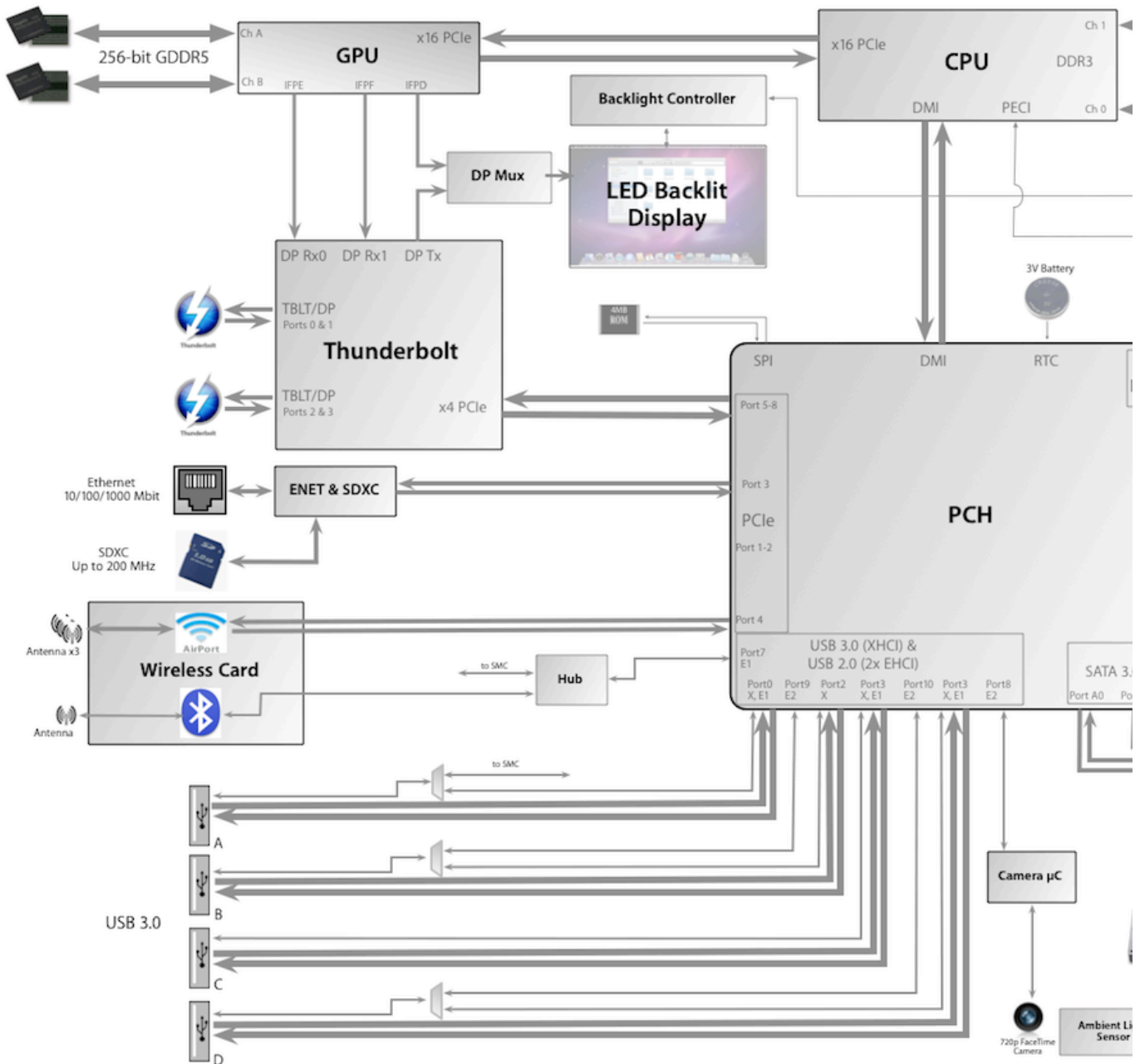


Block Diagram

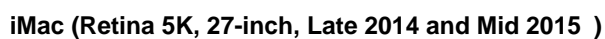
Block Diagram for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

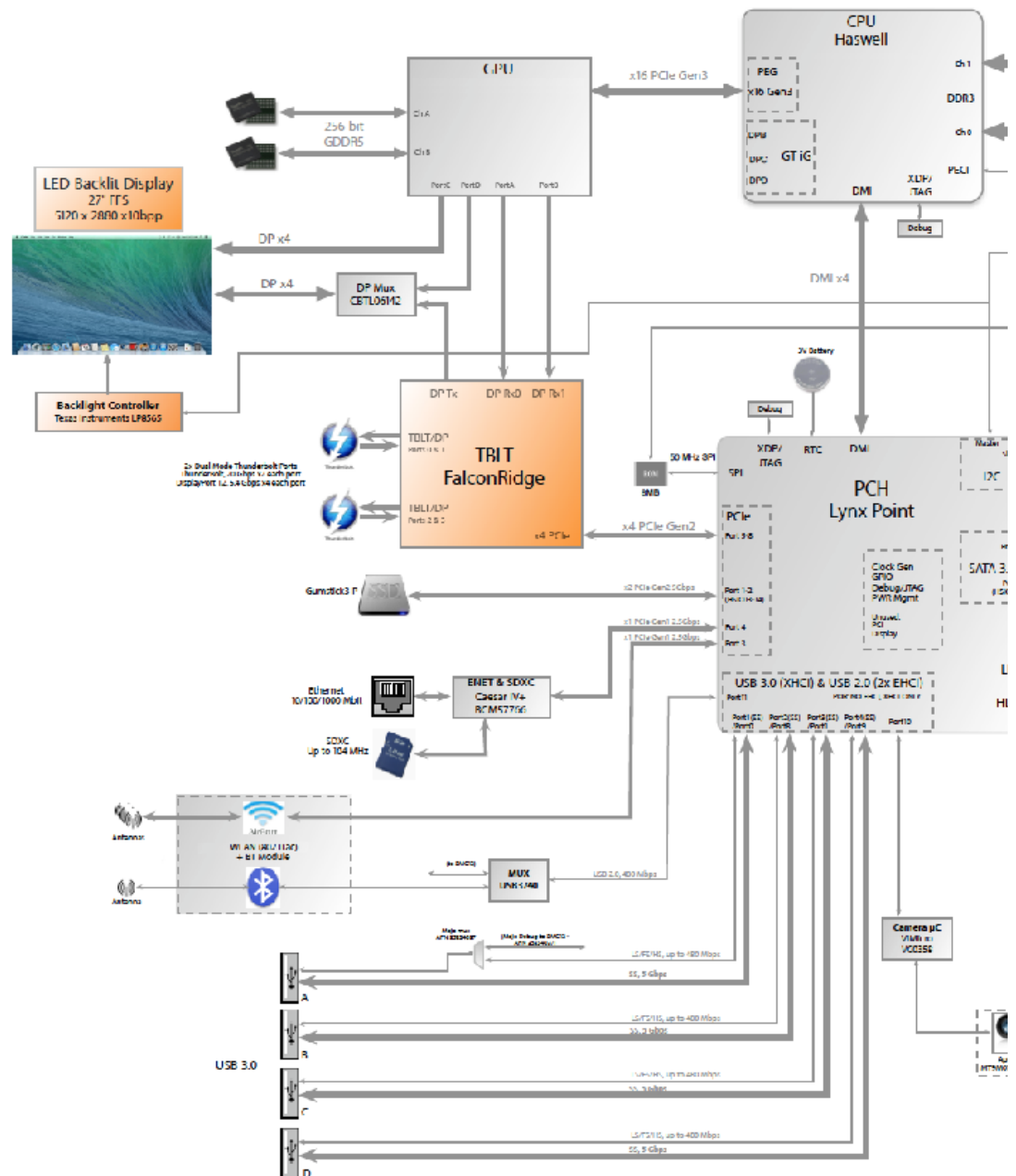
Refer to this diagram to see how modules are interrelated.

iMac (27-inch, Late 2012)



iMac (27-inch, Late 2013)

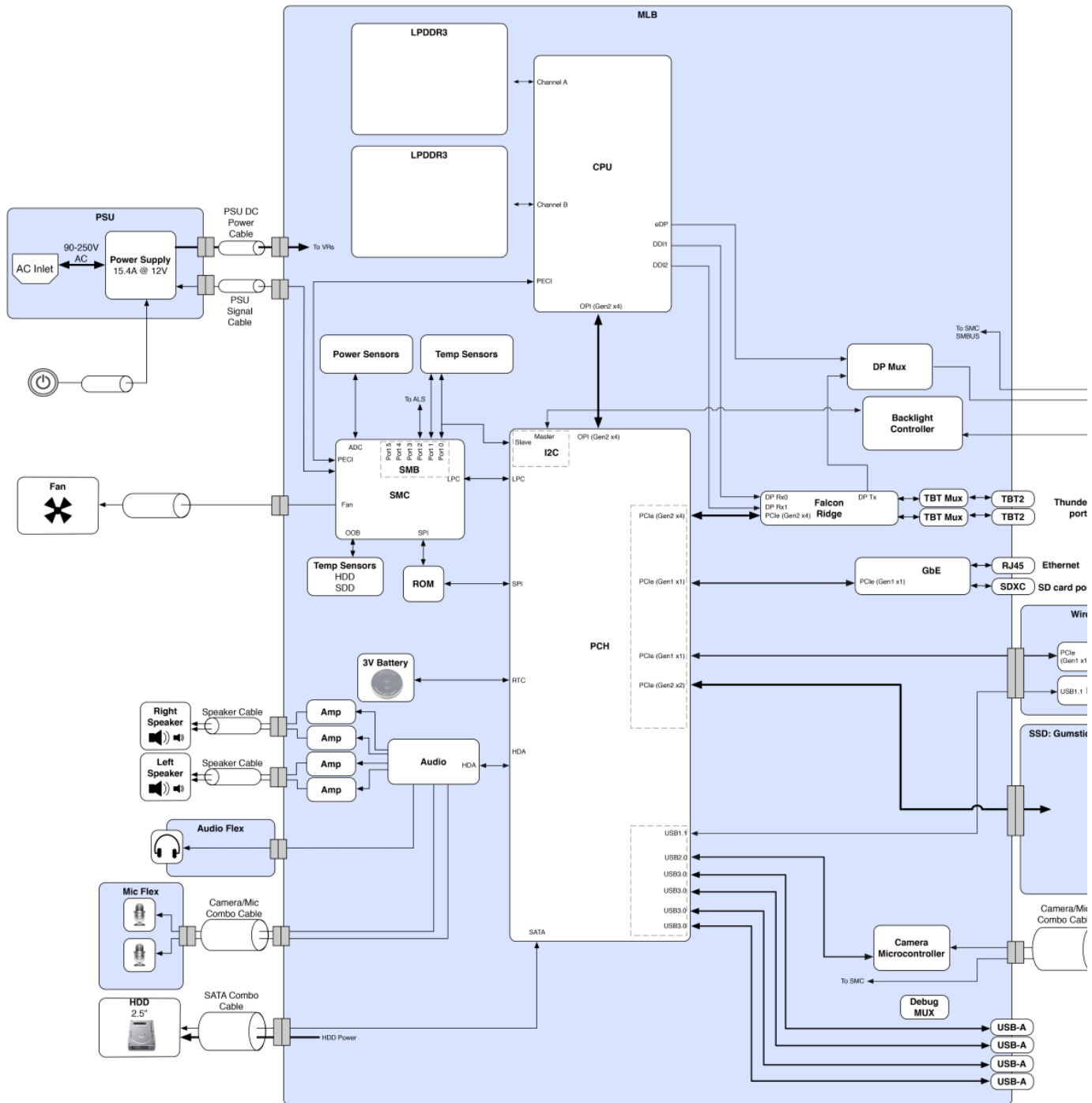




Block Diagram

Block Diagram for iMac (Retina 5K, 27-inch, Late 2015)

Refer to this diagram to see how modules are interrelated.



Functional Overview

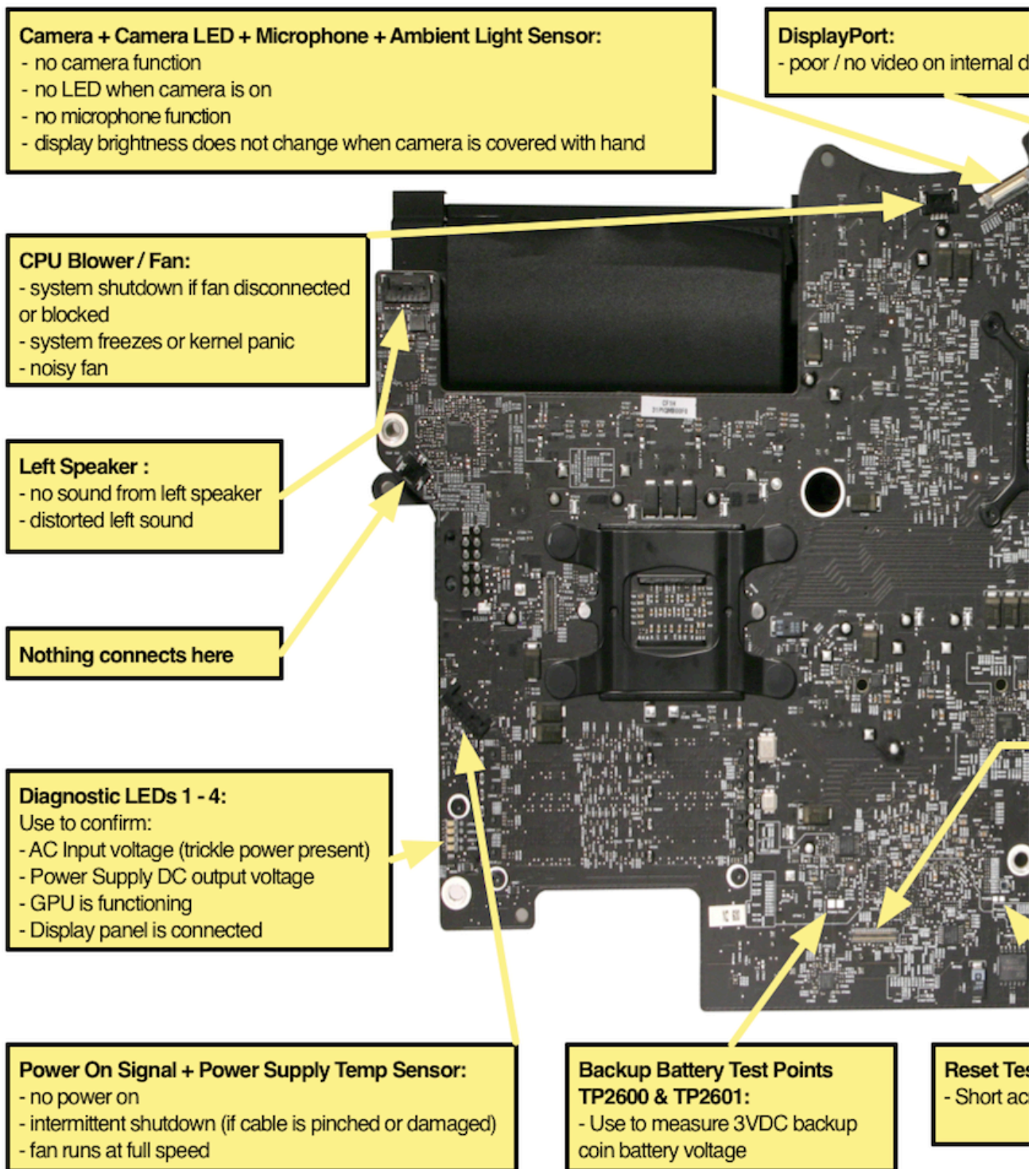
Functional Overview for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

For information on sensors and cable connections, refer to article [TP814: Interconnect Diagram](#).

Front of Logic Board, iMac (27-inch, Late 2012)

Refer to this diagram for symptoms related to connectors on the front of the logic board.

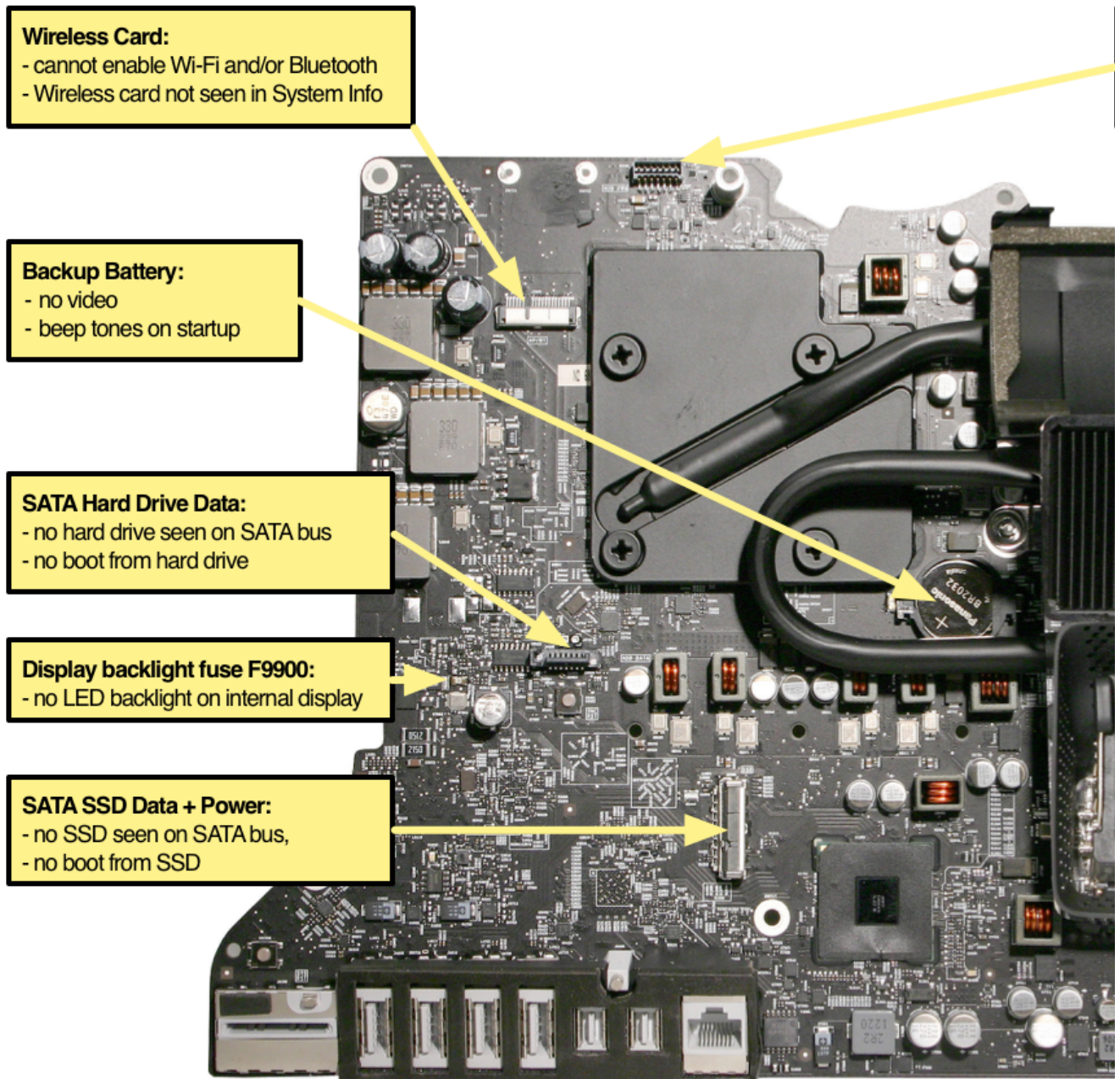
Side facing display a



Back of Logic Board, iMac (27-inch, Late 2012)

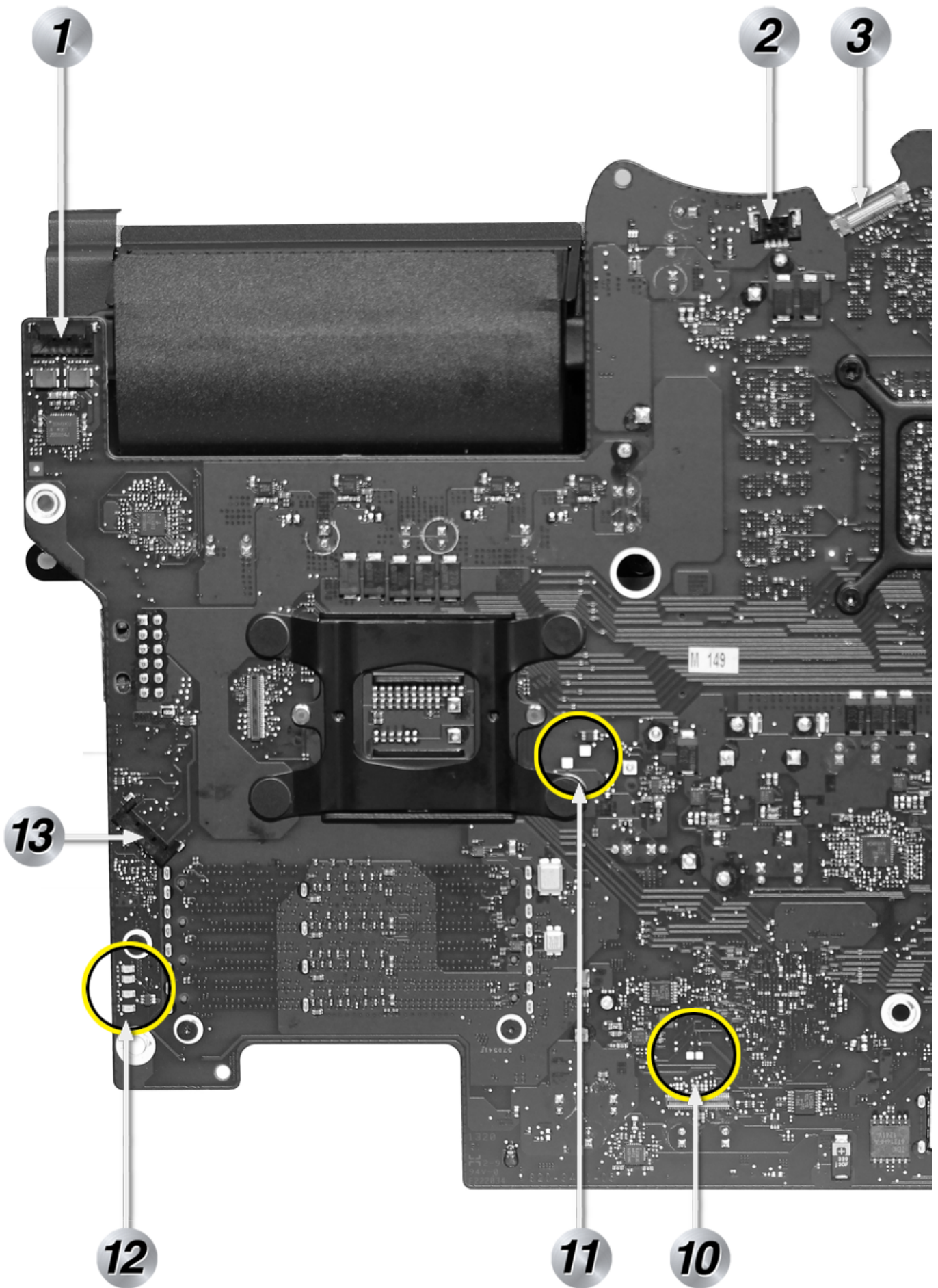
Refer to this diagram for symptoms related to connectors on the back of the logic board.

Side facing rear enclosure



Front of Logic Board, iMac (27-inch, Late 2013)

Refer to this diagram for symptoms related to connectors on the front of the logic board.



1 = Left speaker

- no sound from left speaker
- distorted sound from left speaker

2 = CPU blower fan

- system shuts down if fan disconnected or blocked
- system freezes or kernel panics
- noisy fan perception

3 = Camera, camera LED, microphone, and ambient light sensor

- no camera function
- no LED when camera is on
- no microphone function

4 = DisplayPort

- poor or no video on internal display

5 = Bluetooth antenna

- poor or no Bluetooth signal strength

6 = Wi-Fi antennas

- poor or no Wi-Fi signal strength

7 = Display power (backlight control)

- no LED backlight on internal display

8 = Right speaker

- no sound from right speaker
- distorted sound from right speaker

9 = Audio input/output

- no external optical or analog audio input or output

10 = Reset test points

- short across to reset RTC

11= Backup battery test points

- use to measure 3V DC backup battery coin voltage

12 = Diagnostic LEDs 1-4

- AC input voltage (trickle power present)
- power supply DC output voltage
- GPU is functioning
- display panel is connected

13 = Power-on signal + power supply temp sensor

- no power on
- intermittent shutdowns (if cable is pinched or damaged)

Back of Logic Board, iMac (27-inch, Late 2013)

Refer to this diagram for symptoms related to connectors on the back of the logic board.



14 = Wireless card

- cannot turn on Wi-Fi and/or Bluetooth
- Wi-Fi not seen in System Info > Network > Wi-Fi
- Bluetooth not seen in System Info > USB

15 = SATA hard drive power

- no SATA hard drive seen on SATA bus
- no boot from hard drive or Fusion Drive

16 = Backup battery

- no video
- beep tones on startup

17 = DC power in

- no power

18 = Memory

- no boot
- beep tones on startup
- freezes or kernel panics

19 = SATA Express flash storage data + power

- no flash storage seen on SATA Express bus
- no boot from flash storage or Fusion Drive

20 = SATA hard drive data

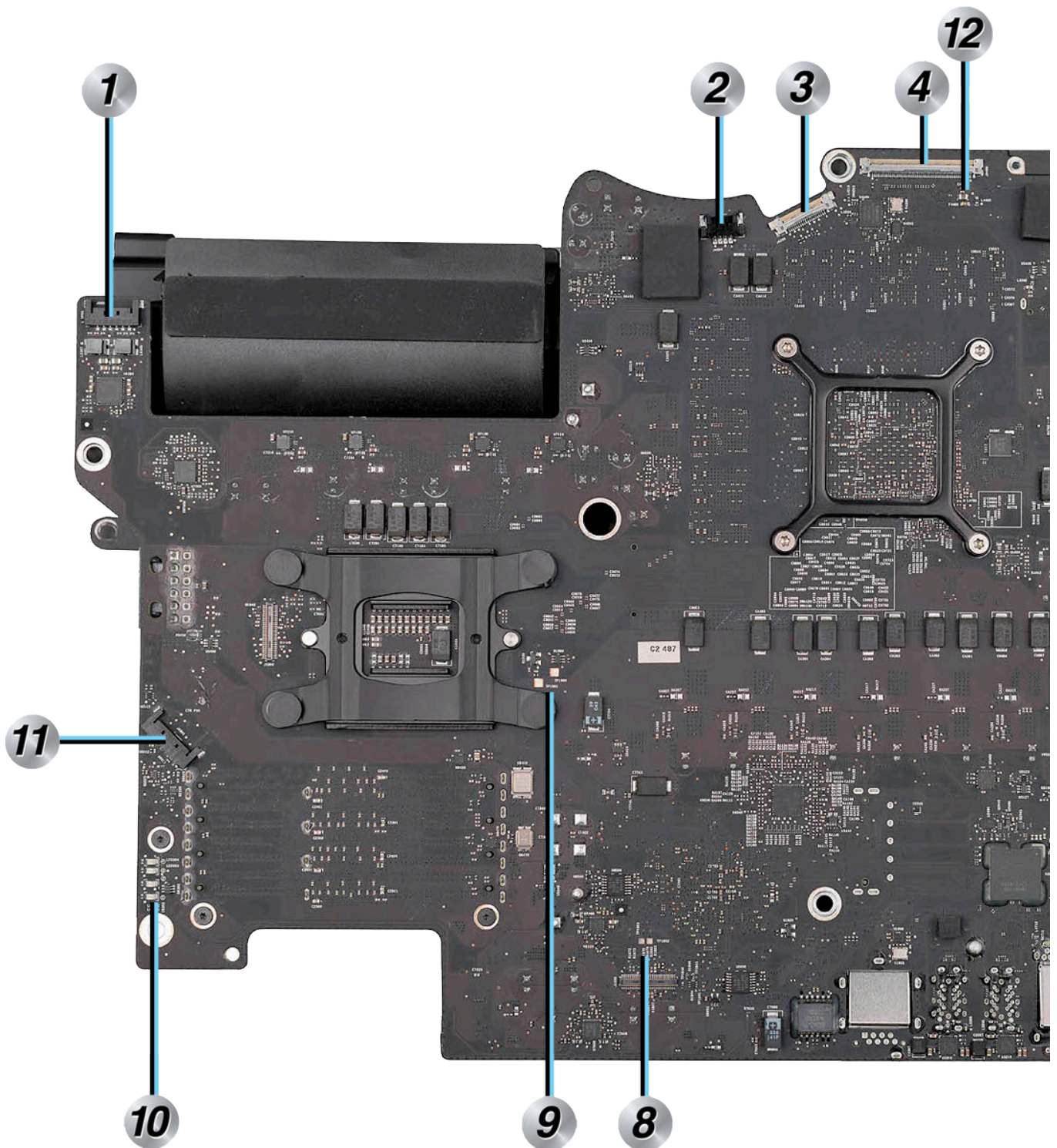
- no SATA hard drive seen on SATA bus
- no boot from hard drive

21 = Backlight Fuse (F8300)

- no backlight on internal display

Front of Logic Board, iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

Refer to this diagram for symptoms related to connectors on the front of the logic board.



1 = Left speaker

- no sound from left speaker
- distorted sound from left speaker

2 = CPU blower fan

- system shuts down if fan is disconnected or blocked
- system freezes or kernel panics
- noisy fan perception

3 = Camera, camera LED, microphone, and ambient light sensor

- no camera function
- no LED when camera is on
- no microphone function

4 = DisplayPort

- poor or no video on internal display

5 = Display power (backlight control)

- no LED backlight on internal display

6 = Right speaker

- no sound from right speaker
- distorted sound from right speaker

7 = Audio input/output

- no external optical/analog audio input or output

8 = Reset test points

- short across to reset RTC

9 = Backup battery test points

- use to measure 3V DC backup battery coin voltage

10 = Diagnostic LEDs 1-4

- AC input voltage (trickle power present)
- power supply DC output voltage
- GPU is functioning
- display panel is connected

11 = Power-on signal and power supply temperature sensor

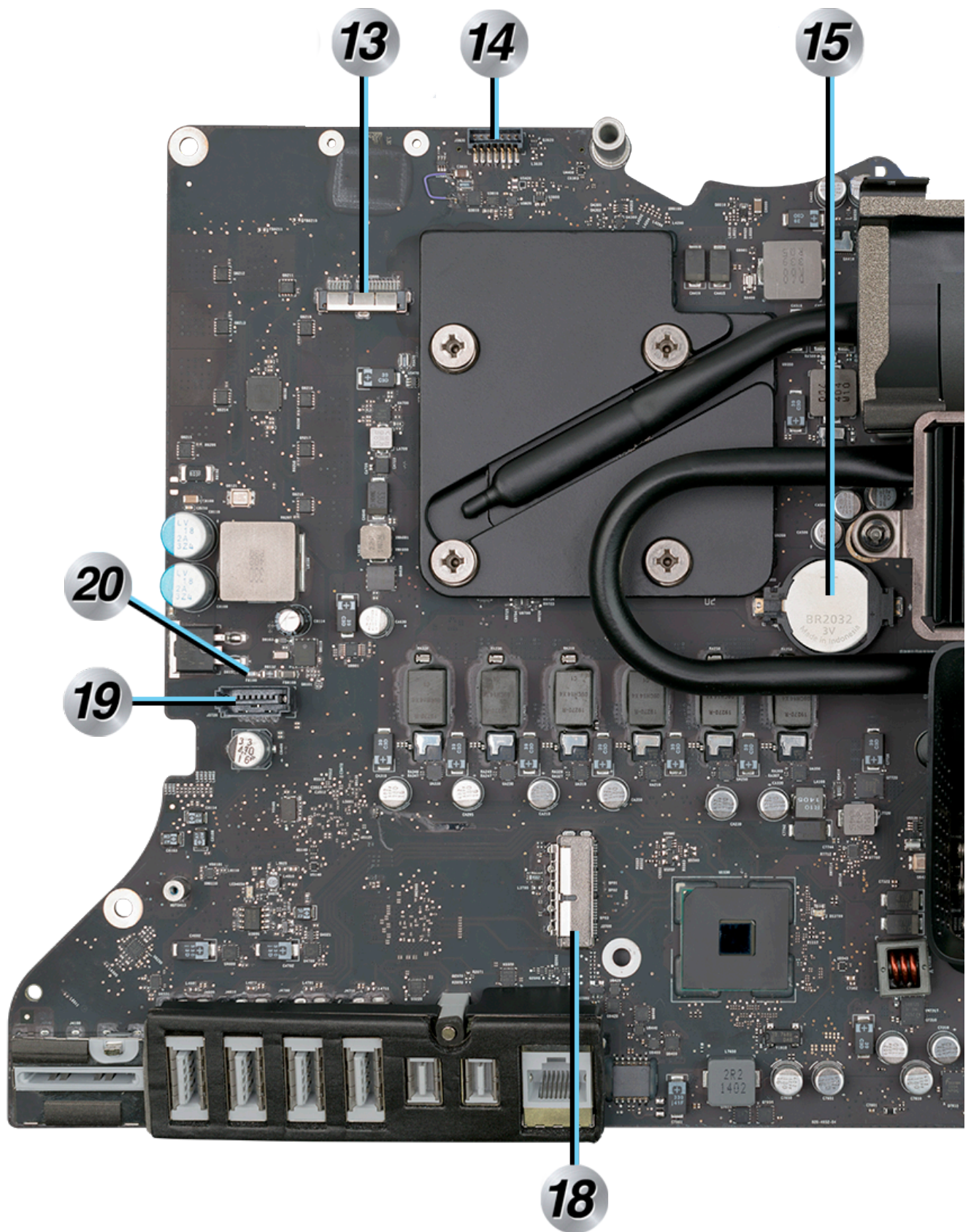
- no power on
- intermittent shutdowns (if cable is pinched or damaged)

12 = Display Fuse (F4400)

- poor or no video on internal display

Back of Logic Board, iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

Refer to this diagram for symptoms related to the connectors on the back of the logic board.



13 = Wireless card

- cannot enable Wi-Fi and/or Bluetooth
- Wi-Fi is not seen in System Info > Network > Wi-Fi
- Bluetooth is not seen in System Info > USB

14 = SATA hard drive power

- no SATA hard drive seen on SATA bus
- no boot from hard drive or Fusion Drive

15 = Backup battery

- no video
- beep tones on startup

16 = DC power in

- no power

17 = Memory

- no boot
- beep tones on startup
- freezes or kernel panics

18 = SATA Express flash storage data and power

- no flash storage seen on SATA Express bus
- no boot from flash storage or Fusion Drive

19 = SATA hard drive data

- no SATA hard drive seen on SATA bus
- no boot from hard drive

20 = Backlight Fuse (F8100)

- no backlight on internal display

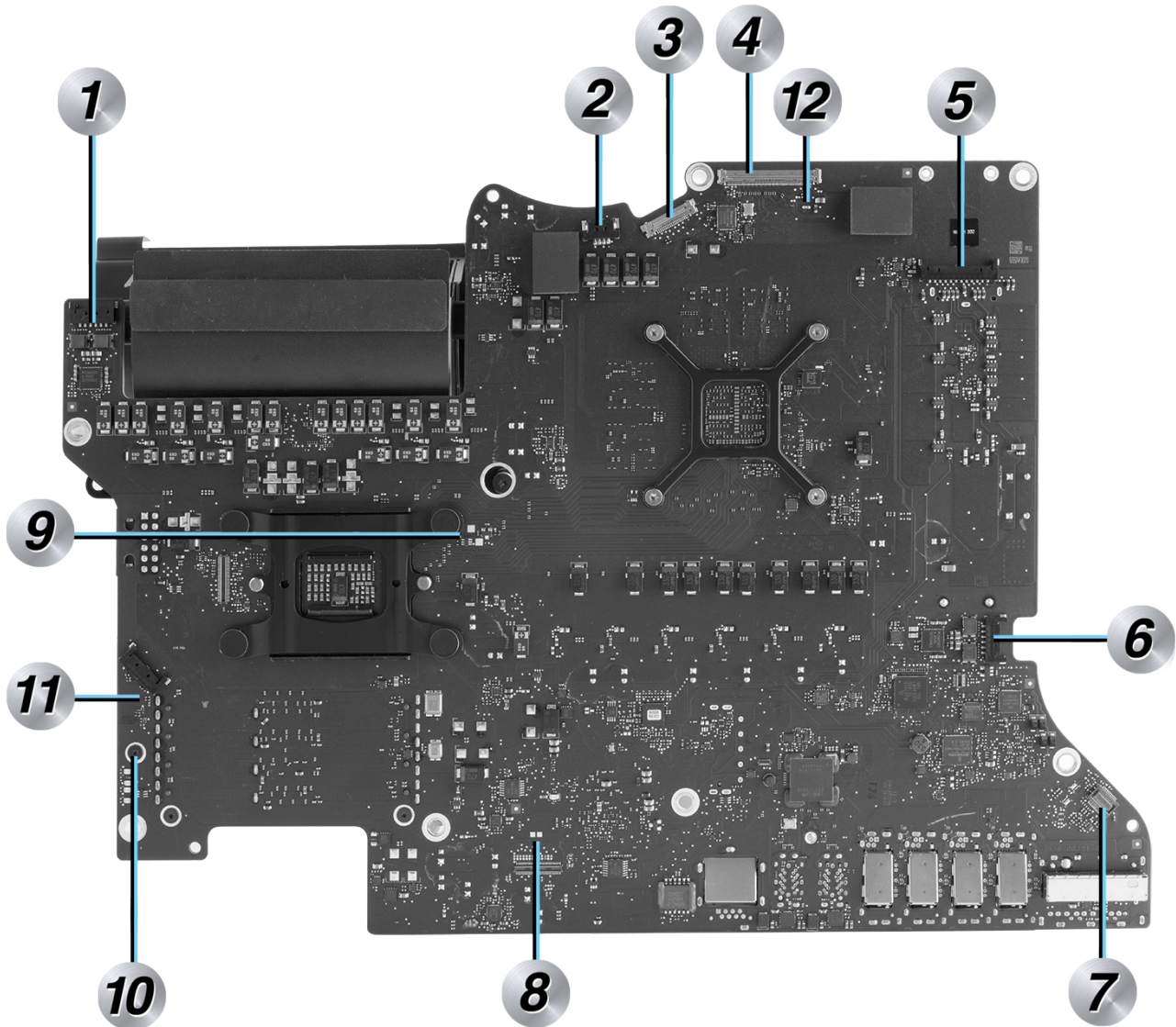
Functional Overview

Functional Overview for iMac (Retina 5K, 27-inch, Late 2015)

For information on sensors and cable connections, refer to article [TP1384: Interconnect Diagram](#).

Front of Logic Board

Refer to this diagram for symptoms related to connectors on the front of the logic board.



1 = Left speaker

- no sound from left speaker
- distorted sound from left speaker

2 = CPU blower fan

- system shuts down if fan is disconnected or blocked
- system freezes or kernel panics
- noisy fan perception

3 = Camera, camera LED, microphone, and ambient light sensor

- no camera function
- no LED when camera is on
- no microphone function

4 = DisplayPort

- poor or no video on internal display

5 = Display power (backlight control)

- no LED backlight on internal display

6 = Right speaker

- no sound from right speaker
- distorted sound from right speaker

7 = Audio input/output

- no external optical/analog audio input or output

8 = Reset test points

- short across to reset RTC

9 = Backup battery test points

- use to measure 3V DC backup battery coin voltage

10 = Diagnostic LEDs 1-4

- AC input voltage (trickle power present)
- power supply DC output voltage
- GPU is functioning
- display panel is connected

11 = Power-on signal and power supply temperature sensor

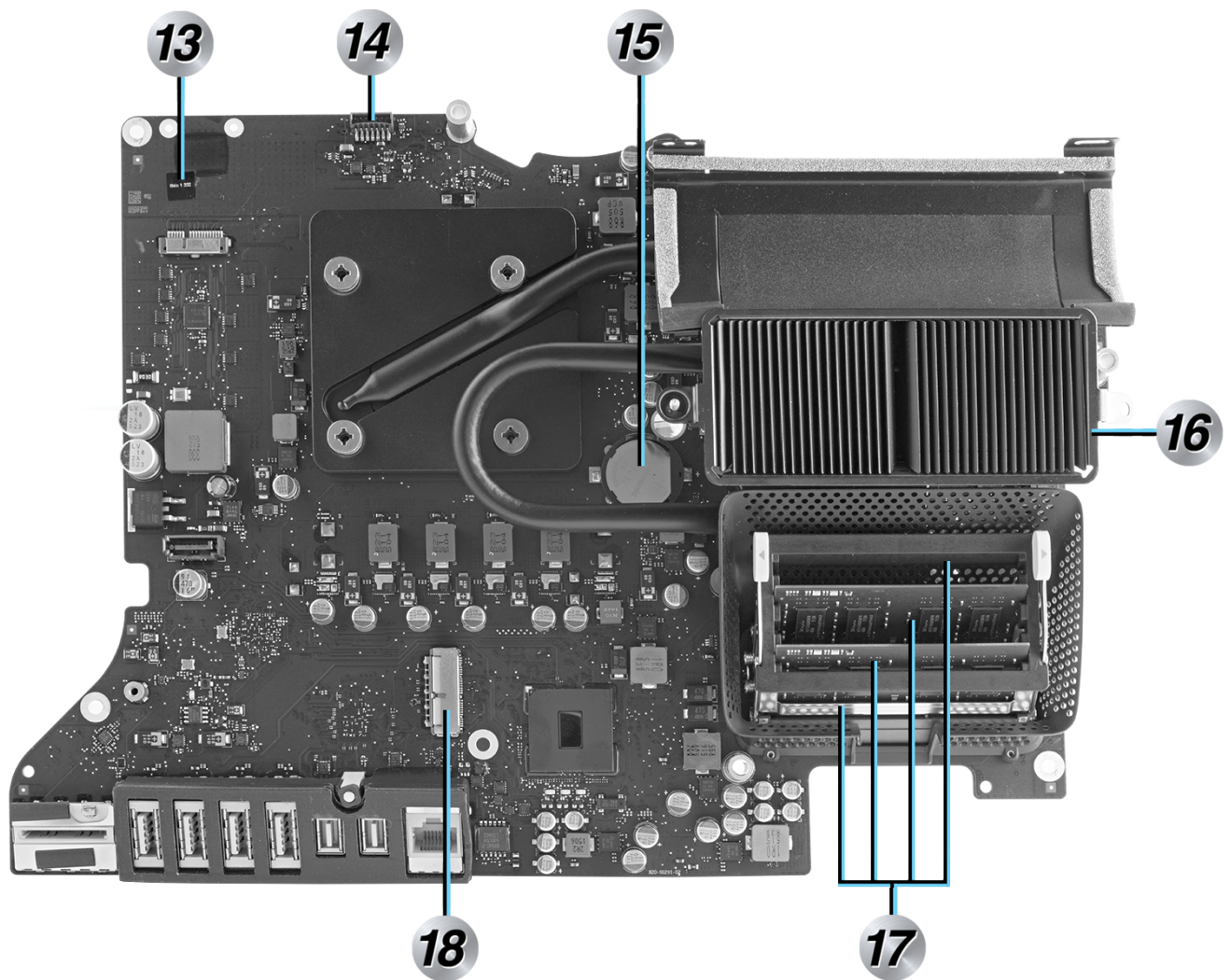
- no power on
- intermittent shutdowns (if cable is pinched or damaged)

12 = Display Fuse (F4400)

- No video but LED backlight on internal display

Back of Logic Board

Refer to this diagram for symptoms related to the connectors on the back of the logic board.



13 = Wireless card

- cannot enable Wi-Fi and/or Bluetooth
- Wi-Fi is not seen in System Info > Network > Wi-Fi
- Bluetooth is not seen in System Info > USB

14 = SATA hard drive power

- no SATA hard drive seen on SATA bus
- no boot from hard drive or Fusion drive

15 = Backup battery

- no video
- beep tones on startup

16 = DC power in

- no power

17 = Memory

- no boot
- beep tones on startup
- freezes or kernel panics

18 = SATA Express flash storage data and power

- no flash storage seen on SATA Express bus
- no boot from flash storage or Fusion drive

18 = SATA hard drive data

- no SATA hard drive seen on SATA bus
- no boot from hard drive

Bluetooth Device Connection Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD) / flash storage card, stand

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Bluetooth can be enabled, but computer will not pair with known-good Bluetooth keyboard, mouse, or trackpad.Paired Bluetooth devices intermittently lose their connections.Bluetooth data transfer times out or is too slow. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">In System Preferences, make sure Bluetooth is on and set to Discoverable.Attempt to pair the computer with a known-good Bluetooth keyboard, mouse, or trackpad.Reset the Bluetooth device or delete pairing (if applicable).Verify integrity of the user's Bluetooth device with a known-good computer, using article HT204621: Troubleshooting wireless mouse and keyboard issues.Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.Check for and apply latest software and firmware updates.If Bluetooth pairs normally at your service location, research potential sources of interference in the user's environment, such as microwave ovens or cordless phones in the 2.4/5GHz range. See article HT201542: Wi-Fi and Bluetooth: Potential sources of wireless interference. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Mac Resource Inspector (MRI) test results or System Information > Hardware > USB Device Tree to verify that wireless card is recognized.	Yes	Go to step 2.	<code>\$(nodeText.yesSymptomCode)</code>	
	Does System Information or MRI detect Bluetooth hardware?	No	Go to "Wireless Card Not Recognized" troubleshooting flow.	<code>\$(nodeText.noSymptomCode)</code>	

	Check	Result	Action	Code	Commodity
2.	<p>Open System Preferences > Bluetooth. Remove all paired devices. Pair computer with a known-good Bluetooth device. Run latest version of Bluetooth Service Diagnostic (BSD) while actively paired with known-good device.</p> <p>Does computer pass BSD tests?</p>	Yes	<p>The computer appears to be performing to specification when paired with a known-good Bluetooth device. The user's Bluetooth device may be the issue.</p> <p>Go to "External Apple Bluetooth Peripherals" troubleshooting flow.</p>	<p>\$(nodeText.yesSymptomCode)</p>	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
3.	<p>Start up from known-good, up-to-date, bootable OS X volume. Try to connect to a known-good Bluetooth device. Compare Bluetooth performance and reliability to a known-good computer of similar type and Bluetooth specification.</p> <p>Is Bluetooth performance comparable between user's computer and known-good computer?</p>	Yes	<p>Refer to article HT204319: OS X versions and builds included with Mac computers and restore the computer to the correct build of OS X. Verify resolution.</p>	<p>\$(nodeText.yesSymptomCode)</p>	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
4.	<p>Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>Remove LCD panel with glass.</p> <p>Locate the A3 Bluetooth antenna (second from left), and inspect antenna's cable and connector for any damage.</p> <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Are antenna cable and connector in good condition?</p>	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	<p>Replace Bluetooth antenna. Verify issue resolved.</p>	<p>X03</p>	<p>OTHER ELECTRIC</p>

	Check	Result	Action	Code	Commodity
5.	Locate A3 Bluetooth antenna port on wireless card (second from left), and verify it is not damaged, loosened, or unsoldered. Reseat antenna connector to wireless card. Make sure connection is secure and correctly aligned. Is A3 antenna connector port in good condition and securely seated?	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Replace wireless card. Verify issue resolved.	N17	WIRELESS DEVICE
6.	Reseat A3 antenna cable connection to wireless card (second from left). Connect an external display and try to pair with a known-good Bluetooth device. Did computer pair successfully with known-good Bluetooth device?	Yes	Issue resolved by reseating Bluetooth antenna. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	
7.	The Bluetooth antenna is located on upper edge of the enclosure and is available as a standalone part. Do you have immediate access to a known-good Bluetooth antenna?	Yes	Go to step 8.	\$(nodeText.yesSymptomCode)	
		No	Replace Bluetooth antenna. Verify issue resolved.	X03	OTHER ELECTRIC
8.	Substitute known-good (upper) Bluetooth antenna. Connect an external display and try to pair with a known-good Bluetooth device. Did computer pair successfully with known-good Bluetooth device?	Yes	Replace Bluetooth antenna. Verify issue resolved.	X03	OTHER ELECTRIC
		No	Replace user's wireless card. Reinstall user's Bluetooth antenna. Verify issue resolved.	N15	WIRELESS DEVICE
9.	<ul style="list-style-type: none"> Run latest version of Bluetooth Service Diagnostic to verify Bluetooth functionality. Pair with a known-good Bluetooth device and verify that connection is sustained for several minutes. Is issue resolved?	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Ethernet Issues

Unlikely causes:

AirPort/Bluetooth antenna(s), battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• No Ethernet device present.• Unable to access Ethernet network resources.• Ethernet device shows no connection.• Ethernet device unable to get an IP address.• Slow Ethernet network performance. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify network setup by accessing it directly via a known-good computer's Ethernet port.2. Launch System Information. Verify that computer's Ethernet port appears in the Network devices tree.3. Test with known-good network hardware and an Ethernet cable (Cat-5 or better is recommended for 100+ Mbps connections).4. Using known-good network hardware and cable, start up from a known-good, up-to-date OS X volume. Go to Network Utility > Info and verify that Link Status is "Active."5. Check network settings. If a known-good DHCP server is available, set System Preferences > Network > Ethernet to Using DHCP. Verify IP address. (If it begins with 169.x.x.x, system was unable to get a valid IP address.) See article PH18513: Renew an IP address from the DHCP server.6. When started up from user's OS, revert to default network settings by creating a new location in System Preferences > Network.7. Check for and apply latest software and firmware updates. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Ethernet port for dust, debris, damage, or bent pins. Use compressed air to remove debris. Plug in a known-good Ethernet cable and make sure all pins make physical contact with connector. Are any Ethernet port pins damaged or insufficiently contacting the known-good Ethernet connector?	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
2.	Inspect logic board, Ethernet port, and enclosure for dents, scratches, or other indications of impact or abuse. Does accidental damage appear to be cause of issue?	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M10	MLB
3.	Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options. Does user want to proceed with out-of-warranty repair?	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	Issue resolved. Return computer to user using correct positioning.	\$(nodeText.noSymptomCode)	
4.	Ensure that user's computer is connected to the Internet using a known-good Ethernet cable, and that Wi-Fi is turned off so that all network traffic goes through built-in Ethernet. Start up computer using OS X Recovery or an up-to-date, bootable OS X volume. Hold down Command-R during startup to restart from recovery partition. See articles HT201314: OS X: About OS X Recovery and HT204319: OS X versions and builds included with Mac computers . Open Safari and attempt to access a known-good external web page such as www.apple.com to verify Ethernet connectivity. Look for the web page to load, or for a timeout indicating page did not load. Are Ethernet network resources accessible starting from recovery partition or a known-good OS?	Yes	Reinstall correct build of OS X on user's computer. Issue resolved by reinstalling correct build of OS X on user's computer.	\$(nodeText.yesSymptomCode)	
		No	Go to step 5.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
5.	Restart user's computer to OS on its built-in OS X boot volume.	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
	<p>In System Preferences > Network > Ethernet, verify that link status is Connected (green dot) and that a valid IP address is listed. Connect computer to an Ethernet network with a known-good DHCP server. Make sure static DHCP maps or filtering are not preventing address allocation.</p> <p>Note: DHCP allocation may not be instantaneous, depending on network. Retest.</p> <p>Is Ethernet link status active?</p>	No	Replace logic board. Verify issue resolved.	M10	MLB
6.	<p>Go to System Preferences > Network > Ethernet and obtain router IP address. Use Network Utility to ping router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility able to ping router IP address?</p>	Yes	No performance or connectivity issues detected. No repair necessary. The problem may be the network environment. Refer user to article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection .	\$(nodeText.yesSymptomCode)	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	
7.	<p>Perform network testing from previous step, using same cable and network, but with a known-good computer.</p> <p>Is network performance of user's computer inferior to known-good computer?</p>	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	No performance or connectivity issues detected. No repair necessary. The problem may be the network environment. Refer user to article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection .	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
8.	1. Connect Ethernet cable to a known-good network with a DHCP server. 2. In System Preferences > Network > Ethernet, verify link status is Connected (green dot). 3. Configure TCP/IP settings to Using DHCP and check that a valid IP address is obtained from server (not a self-assigned one starting with 169.x.x.x). 4. Launch web browser and verify that you can access websites and download files. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

Thunderbolt Ethernet Adapter Connectivity Issues

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No Ethernet present in Network preferences.Unable to access Ethernet network resources.Ethernet shows no active link or connection.Ethernet intermittently drops connection.Ethernet unable to get an IP address.Slow Ethernet network performance. <p>Note: These symptoms address issues with the Thunderbolt Ethernet Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the 'Troubleshoot another issue' button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options. Refer to article OP14: SERVICE: Determining and quoting accidental damage for Mac portables.</p>	<ol style="list-style-type: none">Verify network setup by accessing it directly via an Ethernet port on a known-good computer.Check System Information. Verify Ethernet port presence in System Information > Hardware > Ethernet Cards. Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt.Try using a known-good Ethernet adapter, network hardware, and Ethernet cable with user's computer. Note: Cat 5 or better is recommended for 100+ Mbps connections.Using a known-good Ethernet adapter, network hardware and cable, start up the computer using OS X Recovery or an up-to-date, bootable OS X volume. Hold down Command (⌘) + R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery. Go to Network Utility > Info and verify Link Status is "Active."Check network settings. If a known-good DHCP server is available, set System Preferences > Network > Ethernet to "Using DHCP." Verify IP address. Note: If the IP address begins with 169.x.x.x, the system was unable to get a valid IP address. See article PH18513: Renew an IP address from the DHCP server.Start up from user's OS. Revert to default network settings by creating a new location in System Preferences > Network.Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Check for and apply the latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect both connectors, cable, and body of Thunderbolt Ethernet Adapter. Check for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
	Did you find any damaged components?				

	Check	Result	Action	Code	Commodity
2.	Using article OP14: SERVICE: Determining and quoting accidental damage for Mac portables as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	If applicable, discuss out-of-warranty repair options. Refer to article OP18: SERVICE: Flat Rate and Accidental Damage Repair Pricing for Mail-In Mac Products . Does user want to proceed with out-of-warranty repair?	No	Issue resolved. Return computer to user using correct positioning.	\${nodeText.noSymptomCode}	
3.	Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
	Verify Ethernet port presence in System Information > Hardware > Ethernet Cards. Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt. Does user's Thunderbolt Ethernet Adapter appear in both areas of System Information?	No	Go to step 4.	\${nodeText.noSymptomCode}	
4.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
5.	<p>Connect a known-good Thunderbolt Ethernet Adapter to user's computer to verify adapter presence.</p> <p>Verify Ethernet port presence in System Information > Hardware > Ethernet Cards.</p> <p>Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt.</p> <p>Does known-good Thunderbolt Ethernet Adapter now appear in both areas of System Information?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
6.	<p>Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer.</p> <p>Connect adapter's RJ-45 port to an Ethernet network with a known-good DHCP server using a known-good Cat 5 or better Ethernet cable. Start up computer completely.</p> <p>In System Preferences > Network > Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed. Make sure static DHCP maps or filtering are not preventing address allocation.</p> <p>Note: DHCP allocation may not be instantaneous, depending on the network. Retest.</p> <p>Is Ethernet link status active?</p>	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	Go to step 7.	\${nodeText.noSymptomCode}	
7.	<p>To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?</p>	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
8.	<p>Connect known-good Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Connect adapter to known-good DHCP server using a Cat 5 or better Ethernet cable.</p> <p>Start up computer. In System Preferences > Network > Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed.</p> <p>Is Ethernet link status now active?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
9.	<p>Check network connection on user's computer with known-good cable and network, and user's Thunderbolt Ethernet Adapter.</p> <p>Go to System Preferences > Network > Ethernet and obtain Router IP address.</p> <p>Use Network Utility to ping Router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility able to ping Router IP address?</p>	Yes	Go to step 12.	\${nodeText.yesSymptomCode}	
		No	Go to step 10.	\${nodeText.noSymptomCode}	
10.	<p>To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?</p>	Yes	Go to step 11.	\${nodeText.yesSymptomCode}	
		No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
11.	<p>Check network connection on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.</p> <p>Go to System Preferences > Network > Ethernet and obtain Router IP address. Use Network Utility to ping Router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility now able to ping Router IP address?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
12.	<p>Continue to use Network Utility to ping Router IP address. Use a simple hub/switch environment. Verify connection does not randomly disconnect (seen as packet loss during pings).</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is Network Utility able to ping Router IP address consistently, with no packet loss?</p>	Yes	Go to step 15.	\${nodeText.yesSymptomCode}	
		No	Go to step 13.	\${nodeText.noSymptomCode}	
13.	<p>To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?</p>	Yes	Go to step 14.	\${nodeText.yesSymptomCode}	
		No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
14.	<p>Check network performance on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.</p> <p>Continue to use Network Utility to ping Router IP address. Verify connection does not randomly disconnect (seen as packet loss during pings).</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is Network Utility able to ping Router IP address consistently, with no packet loss?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
15.	<p>Connect user's Ethernet Adapter and cable to a known-good computer on same network. Continue to use Network Utility to ping Router IP address.</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is network performance of user's adapter inferior when used with a known-good computer?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>No performance or connectivity issues detected. No repair necessary. The problem may be network environment.</p> <p>Refer user to article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection.</p>	<p>\$(nodeText.noSymptomCode)</p>	

	Check	Result	Action	Code	Commodity
16.	1. Connect Ethernet cable to a known-good network with a DHCP server. 2. In System Preferences > Network > Ethernet, verify the link status is "Connected" (green dot). 3. Configure TCP/IP settings to "Using DHCP" and check that a valid IP address is obtained from server (not a self-assigned one starting with 169.x.x.x). 4. Launch web browser and verify access to websites and download files. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Wi-Fi Connection Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, right speaker, stand

Quick Check

Symptoms	Quick Check
<p>Wi-Fi interface is present and can be enabled but the following symptoms occur during use:</p> <ul style="list-style-type: none"> • Unable to find or connect to wireless networks • Slow or stalled data transfers • Intermittent connection dropouts <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>On user's computer:</p> <ol style="list-style-type: none"> 1. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. 2. Using alternate Ethernet network interface, connect to Internet, then check for and apply latest software and firmware updates. 3. Start up computer using recovery partition or an up-to-date, bootable OS X volume, and attempt to connect to a wireless network. 4. On a known-good computer, go to System Preferences > Sharing and select Internet Sharing. Configure the known-good computer to "Share your connection from" > Ethernet and "To computers using" > Wi-Fi. Try to connect user's computer to the newly created wireless network. 5. Using a known-good OS and base station, compare Wi-Fi throughput in Activity Monitor > Network to that of a similar computer. 6. Refer to article HT202663: Use Wireless Diagnostics to help you resolve Wi-Fi issues on your Mac to familiarize yourself with the OS X Wireless Diagnostic utility. 7. Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. 8. Reset the SMC using the procedure for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac. <p>If the issue cannot be reproduced on site, prompt the user to check their Wi-Fi base station for the following:</p> <ol style="list-style-type: none"> 1. Check for base station firmware updates. 2. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens and cordless phones. See article HT201542: Wi-Fi and Bluetooth: Potential sources of wireless interference. 3. Make sure base station is not using MAC address filtering or has not created a hidden network. 4. Make sure base station is not set to low-power transmission mode. 5. Make sure base station is not using an unsupported connection and encryption protocol. 6. Check for Wi-Fi channel overlap (a nearby base station using an adjacent channel). 7. Connect to a known-good test network. 8. Test in a different environment. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips refer to articles:</p> <ul style="list-style-type: none"> • TP833: iMac and Displays: Power Supply Cover Instructions • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) or check System Information to see whether the wireless card is recognized.	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
	System Information: <ul style="list-style-type: none"> Network > Wi-Fi > Interfaces Is Wi-Fi service detected in MRI or System Information?	No	Go to “Wireless Card Not Recognized” troubleshooting flow.	`\${nodeText.noSymptomCode}`	
2.	Start up computer using an up-to-date, bootable OS X volume. Attempt to reproduce the Wi-Fi performance or connection issue.	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
	Does issue persist with known-good OS?	No	Refer to article HT204319: OS X versions and builds included with Mac computers and install correct version of OS X. Check for and apply latest software and firmware updates. Verify issue resolved.	`\${nodeText.noSymptomCode}`	
3.	Turn off Bluetooth to eliminate potential interference. Check for other interference such as microwave ovens or cordless phones. See article HT201542: Wi-Fi and Bluetooth: Potential sources of wireless interference . Change base station channel.	Yes	Go to step 4.	`\${nodeText.yesSymptomCode}`	
	Does the issue persist?	No	Issue caused by interference. Remove sources of interference, or use a different Wi-Fi channel or mode (2.4GHz or 5GHz). Verify issue resolved.	`\${nodeText.noSymptomCode}`	
4.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 6.	`\${nodeText.yesSymptomCode}`	
	Remove LCD panel with glass. Locate the three Wi-Fi antennas and inspect each antenna's cable and connector for any damage. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Are Wi-Fi antenna cables and connectors in good condition?	No	Go to step 5.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
5.	<p>Verify whether affected Wi-Fi antenna is available separately as a service part.</p> <p>Is Wi-Fi antenna available as service part?</p>	Yes	Replace affected Wi-Fi antenna. Verify issue resolved.	X03	OTHER ELECTRIC
		No	<p>ESCALATION REQUIRED.</p> <p>The antenna is part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
6.	<p>Locate Wi-Fi antenna connector ports on wireless card and verify that they are not damaged, loosened, or unsoldered. Reseat antenna connectors to wireless card. Make sure connections are secure and correctly aligned.</p> <p>Are Wi-Fi antenna connector ports in good condition and securely seated?</p>	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Replace wireless card. Verify issue resolved.	N17	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
7.	<p>To verify Wi-Fi performance and reliability, start up computer using an up-to-date, bootable OS X, 10.8.4 or later volume for access to Wireless Diagnostics application. See article HT202663: Use Wireless Diagnostics to help you resolve Wi-Fi issues on your Mac to familiarize yourself with wireless diagnostic utilities.</p> <p>Connect to a known-good wireless network and open Wireless Diagnostics > Window > Performance. Review Quality and Rate graphs to evaluate signal of wireless connection. Verify signal is good or excellent and transmission rate (Tx Rate) is comparable to another known-good computer of similar type and Wi-Fi specification. Where available, switch between 2.4GHz and 5GHz networks to verify signal quality is comparable to a known-good computer. Using a network with a high transmission rate, download a large file from a known-good website or file server. Compare network performance to another known-good computer of similar type and Wi-Fi specification. Verify throughput using Activity Monitor > Network.</p> <p>Are performance and throughput comparable between user's computer and a known-good computer?</p>	Yes	Wi-Fi performance is within specification. Verify issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 8.	`\${nodeText.noSymptomCode}`	
8.	<p>To completely troubleshoot this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Wireless card • Standalone Wi-Fi antennas (if available) <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 9.	`\${nodeText.yesSymptomCode}`	
		No	Replace wireless card. Verify issue resolved.	N14	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
9.	Substitute a known-good wireless card and retest, comparing performance and throughput of user's computer with known-good computer. Are performance and throughput comparable between computers?	Yes	Replace wireless card. Verify issue resolved.	N14	WIRELESS DEVICE
		No	Go to step 10.	\${nodeText.noSymptomCode}	
10.	Substitute known-good Wi-Fi antenna. Connect external display and retest, comparing performance and throughput of user's computer with known-good computer. Repeat with other antennas. Are performance and throughput comparable between computers?	Yes	Go to step 11.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
11.	Verify whether affected Wi-Fi antenna is available separately as a service part. Is Wi-Fi antenna available as service part?	Yes	Replace affected Wi-Fi antenna. Verify issue resolved.	X03	OTHER ELECTRIC
		No	ESCALATION REQUIRED. The antenna is part of the rear housing. Replace the rear housing. Verify issue resolved. Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty . Contact ACS for additional support regarding warranty coverage for this part. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
12.	<ul style="list-style-type: none"> Connect to a known-good wireless network and retest data throughput, checking for adequate transfer speeds. Verify that wireless connection is sustained for several minutes. <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Wireless Card Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD), stand, Wi-Fi/Bluetooth antenna(s)

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Wi-Fi cannot be enabled• Wi-Fi is not detected or available in System Information• Bluetooth cannot be enabled• Bluetooth is not detected or available in System Information• Wi-Fi and/or Bluetooth intermittently becomes disabled <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.2. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear startup sound for the second time.3. Start up from recovery partition or an up-to-date, bootable OS X volume, and check for the following:<ul style="list-style-type: none">◦ Wi-Fi network interface presence in System Information and System Preferences > Network.◦ Bluetooth network interface presence in System Information and System Preferences > Bluetooth.4. Using Ethernet network interface, connect to the Internet, then check for and apply latest software and firmware updates.5. Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC). <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with Power Supply Covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) to see whether wireless card is recognized.	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
	Are both Wi-Fi and Bluetooth services detected in MRI?	No	Go to step 4.	`\${nodeText.noSymptomCode}`	
2.	Check MRI to see whether it detects local Wi-Fi network(s).	Yes	Go to “Wi-Fi Connection Issues” troubleshooting flow.	`\${nodeText.yesSymptomCode}`	
	Does MRI only fail the Wi-Fi Scan test?	No	Go to step 3.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
3.	Determine whether the wireless issue is related to Bluetooth or Wi-Fi functionality.	Bluetooth	Go to “Bluetooth Device Connection Issues” troubleshooting flow.	\${nodeText.yesSymptomCode}	
	Is issue related to Bluetooth or Wi-Fi functionality?	Wi-Fi	Go to “Wi-Fi Connection Issues” troubleshooting flow.	\${nodeText.noSymptomCode}	
4.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Issue resolved by reseating wireless card. Verify issue resolved.	\${nodeText.yesSymptomCode}	
	Remove LCD panel with glass.				
	Reseat Wireless Card connection to logic board. Connect an external display, and run MRI or check System Information for Wireless Card presence.				
	Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.	No	Go to step 5.	\${nodeText.noSymptomCode}	
	Are both Wi-Fi and Bluetooth services detected in MRI or System Information?				
5.	To troubleshoot this issue completely, a known-good wireless card is required.	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good wireless card?	No	Replace wireless card. Verify issue resolved.	N18	WIRELESS DEVICE
6.	Substitute a known-good wireless card. Connect an external display and run MRI or check System Information for wireless card presence.	Yes	Replace wireless card. Verify issue resolved.	N18	WIRELESS DEVICE
	Are both Wi-Fi and Bluetooth services detected in MRI or System Information?	No	Go to step 7.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
7.	Determine whether issue is related to Bluetooth or Wi-Fi functionality.	Bluetooth	Go to “Bluetooth Device Connection Issues” troubleshooting flow.	\${nodeText.yesSymptomCode}	
	Is issue related to Bluetooth or Wi-Fi functionality?	Wi-Fi	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M35	MLB
8.	<ul style="list-style-type: none"> • Verify that Wi-Fi network service appears in System Information and can be enabled in System Preferences > Network. • Verify that Bluetooth network interface appears in System Information and can be enabled in System Preferences > Bluetooth. • Connect to a known-good wireless network, and retest data throughput, checking for adequate transfer speeds. • Verify that wireless connection is sustained for several minutes. • Pair with a known-good Bluetooth peripheral. Verify that connection remains functional for several minutes. 	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	N99	
	Is issue resolved?				

Backlight Issue / No Backlight

Unlikely causes:

AirPort/Bluetooth card, AirPort antenna(s), battery, camera, camera/microphone/ALS cable, CPU fan, hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD) / flash storage card, stand

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Display not illuminated.• Flickering, unstable, or non-uniform background lighting.• Poor backlight at some or all settings.• Computer exhibits power, Power-On Self-Test (POST) chime, and fan movement. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply the latest software and firmware updates.2. Refer to article HT204319: OS X versions and builds included with Mac computers and verify that the correct version and build of OS X is installed.3. Cover ambient light sensor to mimic a dark room and adjust brightness to maximum setting using F2 key on wired keyboard.4. Reset PRAM by holding down Command-Option-P-R keys while rebooting until you hear the startup sound for the second time.5. Reset the SMC using the procedure for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).6. Put the computer to sleep by pressing Control-Shift-Eject. Wake it by pressing any key. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect a compatible external display. Check to see whether the external display mirrors the backlight issue or shows any video at all.	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to "Power But Blank/No Video" troubleshooting flow.	\$(nodeText.noSymptomCode)	
	Does the external display show a video signal of any kind?				

	Check	Result	Action	Code	Commodity
2.	Check Mac Resource Inspector (MRI) results to verify that the LCD is detected. You can use Gateway Manager to access log files on the Apple Service Toolkit (AST) server if there is no video image. Consult the AST Reference Guide for more information on using Gateway Manager. If MRI is not available, use System Information to verify that Color LCD appears in the Display device tree.	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
		No	Go to “Power But Blank/No Video” troubleshooting flow.	`\${nodeText.noSymptomCode}`	
Does MRI or System Information detect the LCD?					
3.	Shine bright (low-heat) flashlight onto front of LCD. With computer powered on, verify whether a faint image is visible.	Yes	Go to step 4.	`\${nodeText.yesSymptomCode}`	
		No	Go to “Power But Blank/No Video” troubleshooting flow.	`\${nodeText.noSymptomCode}`	
Does display show a video signal despite not being backlit?					
4.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace the LCD panel with glass, which includes the display power cable. Verify issue resolved.	L09	LCD
		No	Go to step 5.	`\${nodeText.noSymptomCode}`	
Inspect display power cable and its connectors between logic board and LCD panel with glass.					
Is the cable damaged?					
5.	Reseat display power cable between logic board and LCD panel with glass. Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer.	Yes	Issue resolved by reseating display power cable. Verify issue resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 6.	`\${nodeText.noSymptomCode}`	
CAUTION: Be extremely careful when working inside the computer when power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.					
For additional safety information and tips, refer to articles:					
<ul style="list-style-type: none">• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety					
Is normal video restored?					

	Check	Result	Action	Code	Commodity
6.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.</p> <p>Is DisplayPort cable or its connector damaged?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 7.	\${nodeText.noSymptomCode}	
7.	<p>Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.</p> <p>Is logic board cable connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 8.	\${nodeText.noSymptomCode}	
8.	<p>Reseat the DisplayPort cable between LCD panel and logic board.</p> <p>CAUTION: Be extremely careful when working inside the computer when power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.	\${nodeText.yesSymptomCode}	
		No	Go to step 9.	\${nodeText.noSymptomCode}	
9.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to article TP981: iMac (27-inch): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 10.	\${nodeText.yesSymptomCode}	
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE

	Check	Result	Action	Code	Commodity
10.	<p>Important: Ensure that user's computer is shut down, then remove the power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good DisplayPort cable or use the DisplayPort substitution cable found in the extension cable kit in place of suspect DisplayPort cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 11.	\${nodeText.noSymptomCode}	
11.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 12.	\${nodeText.yesSymptomCode}	
		No	Replace the LCD panel with glass. Verify issue resolved.	L03	LCD
12.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass.</p> <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Go to step 13.	\${nodeText.noSymptomCode}	
13.	<p>To troubleshoot this issue completely, a known-good logic board is required.</p> <p>Do you have immediate access to a known-good logic board?</p>	Yes	Go to step 14.	\${nodeText.yesSymptomCode}	
		No	Replace logic board. Verify issue resolved.	M25	MLB

	Check	Result	Action	Code	Commodity
14.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good logic board.</p> <p>Is normal video restored?</p>	Yes	Replace logic board. Verify issue resolved.	M25	MLB
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Power But Blank/No Video

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Power available, but no video visible on display.Fan or hard drive spinning sounds are audible.Caps Lock key LED illuminates when pressed. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Press F2 key to increase screen brightness.Reset SMC using the procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Disconnect all peripherals.Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery.Use Apple Service Toolkit (AST) to run MRI on this UUT, and examine the result logs from the Diagnostic Gateway to determine OS and build version of the customer's computer. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Start up computer using known-good up-to-date, bootable OS X volume.	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 2.	`\${nodeText.noSymptomCode}`	
	Does computer make an audible startup sound?				

	Check	Result	Action	Code	Commodity
2.	While starting up from known-good up-to-date, bootable OS X volume, check whether computer has a memory error (a series of beep tones during startup). Does computer make error tones during startup?	Yes	Go to “Will Not Start Up” troubleshooting flow.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 3.	`\${nodeText.noSymptomCode}`	
3.	Determine whether issue is no backlight or no LCD image: <ul style="list-style-type: none"> Image with no backlight can be seen by shining a low-heat light source onto the built-in display during or after startup. No image can be identified by a blank display with or without backlight or a solid color on the built-in display. Is the issue no backlight or no image?	No Backlight	Go to “Backlight Issue / No Backlight” troubleshooting flow.	`\${nodeText.yesSymptomCode}`	
		No Image	Go to step 4.	`\${nodeText.noSymptomCode}`	
4.	Connect a known-good external display and press power button. Hold down Command-R during startup to restart from the recovery partition. Toggle video mirroring (Command-F1) to view main screen startup screen on external display. Verify that video is correct when viewed on external display. Is correct image visible on external display?	Yes	Go to step 5.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 11.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
5.	<p>Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding and allow the power supply and logic board to discharge.</p> <p>Use one of the methods below to determine whether the user's computer recognizes its built-in LCD display panel.</p> <p>METHOD 1: Review MRI results or System Information > Graphics/Displays. Look for information indicating internal display presence in results.</p> <p>METHOD 2: Remove LCD display panel with glass.</p> <p>Connect AC power cord to computer and plug into mains. Locate diagnostic LEDs on logic board. Connect a known-good external display and press power button. During startup, computer should communicate with video controller and light diagnostic LED #4 to indicate an active display.</p> <p>Note: LED #4 may not light with LCD display panel removed.</p> <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Is built-in LCD display panel detected?</p>	Yes	Go to step 11.	\$(nodeText.yesSymptomCode)	
		No	Go to step 6.	\$(nodeText.noSymptomCode)	
6.	<p>Inspect DisplayPort cable and connectors for damage. Also inspect connectors on LCD display panel and logic board.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Go to step 8.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
7.	<p>Damage to multiple parts requires an escalation to ACS for approval for repair.</p> <p>Is damage limited to DisplayPort cable only?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	
8.	<p>Test the display with a multimeter. For information about using a multimeter, see article HT3250: Diagnostics: Using a digital multimeter.</p> <p>Locate fuse F4400 near the display connector on the logic board. Be careful not to scratch or knock nearby components off the logic board when using the multimeter probes.</p> <p>Set the multimeter to measure ohms (Ω). Place the multimeter probes on each side of the fuse that is soldered to the logic board. The multimeter should measure between zero and one ohm.</p> <p>Refer to article TP913: iMac (21.5-inch): Functional Overview or TP816: iMac (27-inch): Functional Overview for information about locating fuse F4400.</p> <p>Does the multimeter show a reading greater than 1 Ω?</p>	Yes	Replace logic board. Verify issue resolved.	M03	MLB
		No	Go to step 9.	<code>\$(nodeText.noSymptomCode)</code>	

	Check	Result	Action	Code	Commodity
9.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to article TP981: iMac (27-inch): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 10.	<code>\${nodeText.yesSymptomCode}</code>	
		No	Replace DisplayPort cable. Verify issue resolved.	L14	LCD
10.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>If any known-good cables are still installed from previous steps, continue using known-good cables to help find faulty module.</p> <p>Does LCD present video with or without backlight?</p>	With Backlight	Replace DisplayPort cable. Verify issue resolved.	L14	LCD
		No Backlight	Replace the LCD display panel with glass. Verify issue resolved.	L03	LCD

	Check	Result	Action	Code	Commodity
11.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding and allow the power supply and logic board to discharge.	Yes	Go to step 12.	\$(nodeText.yesSymptomCode}	
	<p>Remove LCD display panel with glass.</p> <p>Locate diagnostic LEDs on logic board. Connect AC power cord and press power button, diagnostic LEDs #1 and #2 should be on. This indicates power to computer.</p> <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Are diagnostic LEDs #1 and #2 on?</p>	No	Go to "No Power" troubleshooting flow.	\$(nodeText.noSymptomCode}	
12.	Disconnect DisplayPort cable from logic board. Connect a known-good external display and press power button. Hold down Command-R during startup to restart from recovery partition. Toggle video mirroring (Command-F1) to view main screen startup screen on external display. Verify that video is correct when viewed on external display.	Yes	Replace LCD display panel with glass. Verify issue resolved.	L03	LCD
	Is correct image visible on external display?	No	Replace logic board. Verify issue resolved.	M03	MLB

	Check	Result	Action	Code	Commodity
13.	Restart the computer and verify that the video is fully functional. Is the issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	

Display Anomalies

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Incorrect or missing colors• Non-uniform brightness• Distorted/blurred image• Pixel anomalies• Unstable flickering• Vertical/horizontal lines• Light leakage around display edges <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>References to the “Test Patterns Tool (TPT)” diagnostic in this procedure are intended for all iMacs introduced before 2014, that are supported by AST 1. For iMacs introduced in 2014 and later, use the “Display Anomalies” diagnostic that is supported by AST 2.</p> <ol style="list-style-type: none">1. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery.2. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.3. Check System Preferences > Displays > Color for possible use of a custom display profile. Ensure profile is set to “iMac.”4. Check the brightness setting.5. Check for and apply latest software and firmware updates, especially those that deal with display or graphic issues. Remember that some external Apple display adapters also contain firmware that may need updating. For more information, refer to the following articles:<ul style="list-style-type: none">• HT201177: Apple computers: Troubleshooting issues with video on internal or external displays• HT201261: Intel-based iMac: Available updates6. Clean glass panel and check for dust or debris.7. Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear startup sound for the second time.8. Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC). <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Compare an image on user's display with the same image on an equivalent, known-good computer display.</p> <p>Of the seven issues below, verify that "Incorrect or missing colors" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Incorrect or missing colors • Non-uniform brightness • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Is incorrect or missing colors the primary display issue?</p>	Yes	Go to step 42.	\${nodeText.yesSymptomCode}	
		No	Go to step 2.	\${nodeText.noSymptomCode}	
2.	<p>Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop to Solid Gray Light to verify that issue is non-uniform brightness. Observe display behavior.</p> <p>Of the six issues below, verify that "Non-uniform brightness" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Non-uniform brightness • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Is non-uniform brightness the primary display issue?</p>	Yes	Go to step 38.	\${nodeText.yesSymptomCode}	
		No	Go to step 3.	\${nodeText.noSymptomCode}	
3.	<p>Compare an image on user's display with the same image on an equivalent, known-good computer display.</p> <p>Of the five issues below, verify that "Distorted/blurred image" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Is a distorted or blurred image the primary display issue?</p>	Yes	Go to step 26.	\${nodeText.yesSymptomCode}	
		No	Go to step 4.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
4.	Use Apple Service Toolkit Test Pattern Tools (TPT) test to identify any pixel anomalies. Examine display using solid white, red, green, and blue screens to reveal bright and dark subpixel anomalies or foreign material trapped within display.	Yes	Go to step 24.	\${nodeText.yesSymptomCode}	
	<p>Refer to article HT202025: About LCD display pixel anomalies for Apple products released in 2010 and later to determine whether number of anomalies exceeds specification.</p> <p>Of the four issues below, verify that "Pixel anomalies" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Are pixel anomalies the primary display issue?</p>	No	Go to step 5.	\${nodeText.noSymptomCode}	
5.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to "Unstable Flickering" troubleshooting flow.	\${nodeText.yesSymptomCode}	
	<p>Of the three issues below, verify that "Unstable flickering" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Is unstable flickering the primary display issue?</p>	No	Go to step 6.	\${nodeText.noSymptomCode}	
6.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 11.	\${nodeText.yesSymptomCode}	
	<p>Of the two issues below, verify that "Vertical/horizontal lines" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Vertical/horizontal lines • Light leakage around display edges <p>Are vertical or horizontal lines the primary display issue?</p>	No	Go to step 7.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
7.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
	<p>Verify that "Light leakage around display edges" best describes primary symptom.</p> <p>Customers may report that sides of the display appear to glow when they view it in a dimmed room, particularly when viewing dark or black images.</p> <p>Is light leakage around display edges the primary display issue?</p>	No	LCD seems to be within specifications. Do not replace LCD panel with glass. Verify resolution.	\${nodeText.noSymptomCode}	
8.	Launch the Test Pattern Tool (TPT) within AST to display the All Black display test pattern.	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
	<p>It is very important that you verify this issue using ONLY an all black display test pattern with no other images present such as icons, dock, and so on.</p> <p>Adjust display position and brightness to normal settings.</p> <p>Dim lights so you can more clearly see any light leakage around edges of the LCD display.</p> <p>Is any noticeable light leakage present around edges of the display?</p>	No	Explain to user that display is within specifications. Do not replace LCD panel with glass. Verify resolution.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
9.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Carefully disconnect and remove LCD panel with glass.</p> <p>Carefully clean all surfaces of any leftover tape or adhesive residue where panel contacts enclosure edges to ensure a good seal and a flat mating surface when display is resealed to these surfaces.</p> <p>Remove and closely inspect chin strap for any damage, bowing, or bending.</p> <p>Verify that all cushioned pads are securely installed on each end of the chin strap and are not damaged, torn, out of place, or missing. These pads are part of the chin strap.</p> <p>Does chin strap appear damaged, bent, or bowed?</p>	Yes	Replace chin strap. Reinstall user's LCD display with glass. Verify issue resolved.	X13	PIECE PART
		No	Go to step 10.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
10.	Recheck that previous disassembly was performed properly using proper tools and techniques and not by simply pulling display off. Incorrect removal technique can damage or bow chin strap, causing light leakage in lower display area.	Yes	Replace LCD panel with glass. Verify issue resolved.	L28	LCD
	<p>Reinstall chin strap, being very careful to not damage, bow, or otherwise bend chin strap during installation.</p> <p>Reapply new foam tape gaskets for all four display sides, being very careful to apply the tape smoothly around entire edge.</p> <p>Reinstall LCD panel with glass, being careful when seating edges of display against foam-backed tape around edges to ensure a smooth, complete seal around entire perimeter.</p> <p>Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer.</p> <p>Recheck for light leakage using TPT within AST to display All Black display test pattern.</p> <p>Is any noticeable light leakage still present around edges of display?</p>	No	Issue resolved by reseating display and chin strap. Verify issue resolution.	<p> <code> $\{nodeText.noSymptomCode\}$ </code> </p>	
11.	Connect an external compatible display.	Yes	Go to step 12.	<p> <code> $\{nodeText.yesSymptomCode\}$ </code> </p>	
	Are vertical and/or horizontal lines present on external display?	No	Go to step 17.	<p> <code> $\{nodeText.noSymptomCode\}$ </code> </p>	
12.	Vertical and/or horizontal lines may be related to a failing memory module. Watch closely during startup sequence for exact point at which issue starts to occur.	Before	Go to step 17.	<p> <code> $\{nodeText.yesSymptomCode\}$ </code> </p>	
	Does issue occur BEFORE or AFTER Apple logo and spinning gear appears?	After	Go to step 13.	<p> <code> $\{nodeText.noSymptomCode\}$ </code> </p>	

	Check	Result	Action	Code	Commodity
13.	To start up into Safe Mode, press power button; then as soon as you hear startup sound, hold down Shift key. Shift key should be held as soon as possible after startup sound, but not before sound. Release Shift key when you see gray Apple icon and the spinning gear. Does issue still occur in Safe Mode?	Yes	Go to step 17.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 14.	\$_{nodeText.noSymptomCode}	
14.	Some models have RAM modules that are directly connected to the MLB. You are unable to remove the RAM on these models. Are you able to remove RAM modules?	Yes	Go to step 15.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 17.	\$_{nodeText.noSymptomCode}	
15.	Perform one-by-one replacement of user's memory modules with known-good memory, reassemble and retest. Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules. Note: Be sure to always have at least the minimum amount of memory installed to support computer and its OS. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace a 1 GB module with a known-good 2 GB module to support starting into OS X. Does issue occur only with specific memory module(s)?	Yes	Replace memory module(s). Note: Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.	X06	MEMORY
		No	Go to step 16.	\$_{nodeText.noSymptomCode}	
16.	Install a known-good memory module in one memory slot and retest. Repeat test with known-good memory for each additional memory slot, one at a time. Does issue occur only with a specific memory slot on the logic board?	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M04	MLB
		No	Go to step 17.	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
17.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.</p> <p>Is DisplayPort cable or its connector damaged?</p>	Yes	Go to step 18.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 20.	`\${nodeText.noSymptomCode}`	
18.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to article TP981: iMac (27-inch): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 19.	`\${nodeText.yesSymptomCode}`	
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
19.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 20.	`\${nodeText.noSymptomCode}`	
20.	<p>Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.</p> <p>Is logic board cable connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 21.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
21.	To troubleshoot this issue completely, a known-good LCD panel with glass is required.	Yes	Go to step 22.	`\${nodeText.yesSymptomCode}`	
	Do you have immediate access to a known-good LCD panel with glass?	No	Go to step 23.	`\${nodeText.noSymptomCode}`	
22.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass to test logic board video output.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Is normal video restored?</p>	Yes	Go to step 23.	`\${nodeText.yesSymptomCode}`	
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB
23.	Examine image on display and determine whether lines are vertical or horizontal.	Vertical	Replace LCD panel with glass. Verify issue resolved.	L27	LCD
	Are lines vertical or horizontal?	Horizontal	Replace LCD panel with glass. Verify issue resolved.	L26	LCD
24.	Inspect display closely and determine whether pixel "anomalies" are actually dust or debris on surface of glass panel.	Yes	Clean glass panel. Verify issue resolved.	`\${nodeText.yesSymptomCode}`	
	Are anomalies caused by dust, debris, or other surface contamination?	No	Go to step 25.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
25.	<p>Refer to article HT202025: About LCD display pixel anomalies for Apple products released in 2010 and later to determine whether number of anomalies exceeds specification. Determine whether number of bright or dark pixel anomalies (or a combination of these) exceed specification.</p> <p>Does the number of pixel anomalies exceed the specified limit?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L20	LCD
		No	Explain to user that display is within specifications. Do not replace LCD panel with glass. Verify resolution.	\$(nodeText.noSymptomCode)	
26.	<p>Connect a compatible external display.</p> <p>Does image on external display appear distorted and/or blurred?</p>	Yes	Go to step 27.	\$(nodeText.yesSymptomCode)	
		No	Go to step 32.	\$(nodeText.noSymptomCode)	
27.	<p>A distorted or blurred image may be related to a failing memory module. Watch closely during startup sequence for exact point at which issue starts to occur.</p> <p>Does issue occur BEFORE or AFTER Apple logo and spinning gear appears?</p>	Before	Go to step 32.	\$(nodeText.yesSymptomCode)	
		After	Go to step 28.	\$(nodeText.noSymptomCode)	
28.	<p>To start up into Safe Mode, press power button; then as soon as you hear startup sound, hold down Shift key. Shift key should be held as soon as possible after startup sound, but not before sound. Release Shift key when you see gray Apple icon and the spinning gear.</p> <p>Does issue still occur in Safe Mode?</p>	Yes	Go to step 32.	\$(nodeText.yesSymptomCode)	
		No	Go to step 29.	\$(nodeText.noSymptomCode)	
29.	<p>Some models have RAM modules that are directly connected to the MLB. You are unable to remove the RAM on these models.</p> <p>Are you able to remove RAM modules?</p>	Yes	Go to step 30.	\$(nodeText.yesSymptomCode)	
		No	Go to step 32.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
30.	Perform one-by-one replacement of user's memory modules with known-good memory, reassemble and retest. Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules.	Yes	Replace memory module(s). Note: Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.	X06	MEMORY
	Note: Be sure to always have at least the minimum amount of memory installed to support the computer and its OS. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace a 1 GB module with a known-good 2 GB module to support starting into OS X. Does issue occur only with specific memory module(s)?	No	Go to step 31.	`\${nodeText.noSymptomCode}`	
31.	Install a known-good memory module in one memory slot and retest. Repeat test with known-good memory for each additional memory slot, one at a time.	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M04	MLB
	Does issue occur only with a specific memory slot on logic board?	No	Go to step 32.	`\${nodeText.noSymptomCode}`	
32.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Go to step 33.	`\${nodeText.yesSymptomCode}`	
	Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins. Is DisplayPort cable or its connector damaged?	No	Go to step 35.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
33.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to article TP981: iMac (27-inch): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 34.	\${nodeText.yesSymptomCode}	
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
34.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 35.	\${nodeText.noSymptomCode}	
35.	<p>Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.</p> <p>Is logic board cable connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 36.	\${nodeText.noSymptomCode}	
36.	<p>To completely troubleshoot this issue, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 37.	\${nodeText.yesSymptomCode}	
		No	Replace LCD panel with glass. Verify issue resolved.	L04	LCD

	Check	Result	Action	Code	Commodity
37.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass to test logic board video output.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L04	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB
38.	<p>Determine whether variation in uniformity appears excessive when compared to a known-good similar computer.</p> <p>Does non-uniform brightness exceed that of a known-good computer?</p>	Yes	Go to step 39.	\$(nodeText.yesSymptomCode)	
		No	LCD seems to be within specifications. Do not replace LCD panel with glass. Verify resolution.	\$(nodeText.noSymptomCode)	
39.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove LCD panel with glass. Inspect for mechanical interference from screws or cables making contact with back of LCD panel. Reseat components and cables.</p> <p>Carefully clean all surfaces of any leftover tape or adhesive residue where panel contacts enclosure edges to ensure a good seal and a flat mating surface when display is resealed to these surfaces.</p> <p>Is normal video restored?</p>	Yes	Issue resolved by reseating internal components. Verify issue resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 40.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
40.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Inspect and reseal backlight cable.</p> <p>Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Is normal video restored?</p>	Yes	Issue resolved by reseating backlight cables. Verify issue resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 41.	`\${nodeText.noSymptomCode}`	
41.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reseat DisplayPort cable connector securely to logic board. Reconnect all internal cables and reinstall LCD panel. Retest.</p> <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.	`\${nodeText.yesSymptomCode}`	
		No	Replace LCD panel with glass. Verify issue resolved.	L21	LCD
42.	<p>Verify that display is listed in System Information > Hardware > Graphics/Displays > Video Card. This ensures that color profile can be matched with LCD.</p> <p>Is display hardware detected?</p>	Yes	Go to step 43.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 44.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
43.	Go to System Preferences > Displays > Color to make sure "iMac" is selected under Display profile. Inspect display again for incorrect or missing colors. Are colors still incorrect or missing when display profile is set to "iMac"?	Yes	Go to step 44.	\$_{nodeText.yesSymptomCode}	
		No	Issue resolved by setting a valid display profile. User may have created an off-color calibration setting. Verify resolution.	\$_{nodeText.noSymptomCode}	
44.	Run Mac Resource Inspector (MRI) to check for LCD presence. Is LCD detected (green) in MRI?	Yes	Go to step 46.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 45.	\$_{nodeText.noSymptomCode}	
45.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Reseat DisplayPort cable connector securely to logic board and retest. Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer. CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. For additional safety information and tips refer to articles: <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety 	Yes	Issue resolved by reseating DisplayPort cable. Verify resolution.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 46.	\$_{nodeText.noSymptomCode}	
46.	Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop > Solid Colors to Solid Gray Light. Check to see whether incorrect/missing color issue affects entire screen. Is entire screen affected?	Yes	Go to step 48.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 47.	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
47.	Put computer side-by-side with a known-good equivalent iMac display showing same Solid Gray Light image. Is issue noticeably worse on the user's display?	Yes	Go to step 48.	\${nodeText.yesSymptomCode}	
		No	Small variations in color uniformity are normal and do not warrant replacement of display.	\${nodeText.noSymptomCode}	
48.	To troubleshoot this issue completely, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD panel with glass?	Yes	Go to step 49.	\${nodeText.yesSymptomCode}	
		No	Replace LCD panel with glass. Verify issue resolved.	L02	LCD
49.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good LCD panel with glass to test logic board video output. Is normal video restored?	Yes	Replace LCD panel with glass. Verify issue resolved.	L02	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB
50.	Verify that display issue or anomaly has been resolved. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

No Video to External Display

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">External display is not detected when connected to computerExternal display does not show any video <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Connect a known-good, compatible external display to the computer's video out port. Review article HT201853: About Apple video adapters and cables to help identify which adapters can be used with this computer model.2. If using an Apple Thunderbolt Display, review article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ) to identify which computer models support it.3. Review article HT201177: Apple computers: Troubleshooting issues with video on internal or external displays for common causes of video issues.4. Launch System Information > Hardware > Graphics/Displays, select video card where internal Color LCD display is connected, and verify that external display hardware is recognized.5. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.6. Check for and apply latest software and firmware updates to all involved computers and displays.7. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Refer to article HT204063: How to Reset NVRAM on your Mac.8. If using a computer set in Target Display Mode, then check that the Thunderbolt cable is made by Apple and that the computer intended for use as a display actually supports Target Display Mode via Thunderbolt. Refer to article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ).9. If using with a computer set in Target Display Mode, then reset the SMC on computer used as a display. Refer to article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).10. If using an Apple Thunderbolt Display, then review article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that the computer has the latest Thunderbolt firmware version installed. Also review article HT201164: About Thunderbolt to Thunderbolt cable (2.0 m) for details on Thunderbolt cable usage and supported configurations.11. If using a Mini DisplayPort adapter, then review article HT204149: Apple Mini DisplayPort adapters: Frequently asked questions (FAQ) for details on supported configurations.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect video out port for dust, debris, damage, or bent pins that might cause display cable to make insufficient contact. Use compressed air to remove any debris. Is video out port damaged?	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
2.	Inspect logic board, video out port, and enclosure for dents, scratches, or other indications of impact or abuse. Can you identify signs of accidental damage?	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M24	MLB
3.	Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options Does the user want to proceed with out-of-warranty repair?	Yes	Replace the logic board. Verify issue resolved.	M24	MLB
		No	Issue resolved. Return computer to user using correct positioning.	\$(nodeText.noSymptomCode)	
4.	Connect known-good, compatible external display. Start up from a known-good up-to-date bootable OS X volume and check System Information > Hardware > Graphics/Displays device tree for presence of external display connected to graphics card. Is external display detected?	Yes	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall correct OS X build for this computer model. Verify issue resolved.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M26	MLB
5.	Connect a known-good, compatible display to computer. <ul style="list-style-type: none"> Verify display is functional at computer startup. Verify display is functional after computer is put to sleep and then awakened. Verify other display features are also available (depending on display model: audio, USB, Ethernet, and so forth). Is issue resolved?	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

Thunderbolt Target Display Mode Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer does not initiate Thunderbolt target display mode connectionThunderbolt-capable iMac does not switch to display mode when you press Command-F2 (target display mode trigger) on the iMac keyboard <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check that the Thunderbolt cable is made by Apple (not a third party) and that the computer intended for use as a display supports Target Display Mode via Thunderbolt. Refer to article HT204592: Use your iMac as a display with Target Display Mode.Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller.Check for and apply latest software and firmware updates on both computers.Check System Information > Hardware > Thunderbolt to verify that Thunderbolt hardware is recognized.Try a known-good Apple Thunderbolt Cable (2.0 m).Review the section entitled "How do I get the best performance from Thunderbolt?" in article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that computer has latest Thunderbolt firmware version installed.See article HT201164: About Thunderbolt to Thunderbolt cable (2.0 m).Make sure an Apple aluminum keyboard (wired or wireless) is being used. Earlier Apple and third-party keyboards will not activate Thunderbolt Target Display mode when pressing Command-F2.Try using a known-good Thunderbolt-capable computer for Target Display Mode. Refer to article PH19038: Use another Mac as a display.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	The following iMac models support Target Display Mode:	Yes	Go to step 2.	<code>\$(nodeText.yesSymptomCode)</code>	
	<ul style="list-style-type: none">iMac (21.5-inch, Late 2012, Early 2013, Late 2013, Mid 2014)iMac (27-inch, Late 2012 and Late 2013)	No	Issue resolved. Verify resolution.	<code>\$(nodeText.noSymptomCode)</code>	
	Does the user's computer support Target Display Mode?				

	Check	Result	Action	Code	Commodity
2.	<p>Refer to article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller.</p> <p>Is proper OS X build installed?</p>	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall correct OS X build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.	\$(nodeText.noSymptomCode)	
3.	<p>Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac, with unique user ID (UID) and firmware version shown.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
4.	<p>Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	Go to “Thunderbolt Port Not Recognized” troubleshooting flow.	\$(nodeText.noSymptomCode)	
5.	<p>Inspect Thunderbolt port(s) on user's computer for physical damage, burnt connectors, or misalignment.</p> <p>Does Thunderbolt port show any damage?</p>	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	
6.	<p>Check that physical damage or improper logic board mounting has not caused Thunderbolt ports to be out of alignment. Connect a Mini DisplayPort connector to Thunderbolt ports while mounting logic board to ensure proper alignment for cable insertion and removal. Rule out accidental damage before proceeding.</p> <p>Did logic board realignment correct Thunderbolt port issue?</p>	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M24	MLB

	Check	Result	Action	Code	Commodity
7.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> Thunderbolt-capable iMac Apple Thunderbolt Cable (2.0 m) <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 8.	`\${nodeText.yesSymptomCode}`	
		No	<p>ESCALATION REQUIRED.</p> <p>Request ACS help checking latest updates and System Information > Hardware > Thunderbolt device tree.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
8.	<p>Connect a known-good Apple Thunderbolt Cable (2.0 m) between user's computer and known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer. Verify all available Thunderbolt ports.</p> <p>Does known-good iMac become a target display for user's computer?</p>	Yes	Go to step 11.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 9.	`\${nodeText.noSymptomCode}`	
9.	<p>Check System Information > Hardware > Thunderbolt on user's computer to verify Thunderbolt port connection and port status. The connection to the known-good iMac should show as "Macintosh."</p> <p>Hardware > Graphics > Displays should show any displays recognized by user's computer and list Color LCD and iMac display information.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 10.	`\${nodeText.yesSymptomCode}`	
		No	Replace logic board. Verify issue resolved.	M32	MLB

	Check	Result	Action	Code	Commodity
10.	<p>Reseat both ends of known-good Apple Thunderbolt Cable (2.0 m). Shut down both computers, then start up to desktop. Press Command-F2 on known-good iMac to activate target display mode for user's computer. Verify that video from user's computer is visible on target display iMac.</p> <p>Check System Information > Hardware > Graphics > Displays on user's computer to see if Color LCD and display iMac are present and activated.</p> <p>Verify all available Thunderbolt ports.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 11.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Inform ACS that user's computer cannot activate target display mode on a known-good Thunderbolt iMac while it does show connection to Thunderbolt device tree.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
11.	<p>Continue using known-good Apple Thunderbolt Cable (2.0 m) between user's computer and known-good iMac. Shut down, then start up both computers to desktop. Press Command-F2 on user's iMac to activate target display mode for known-good iMac. Verify that video from known-good iMac is visible on target display of user's iMac. Check System Information > Hardware > Graphics > Displays to see whether Color LCD and user's target display iMac are present and activated on known-good iMac.</p> <p>Is target display video present on user's iMac, and is user's iMac listed in Displays?</p>	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Target display mode should work in both directions. Inform ACS that user's computer cannot be an active target display (as a second display) for known-good Thunderbolt iMac.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
12.	Inspect user's Apple Thunderbolt Cable (2.0 m) cable for physical damage, such as contamination or burnt connectors on either end of cable.	Yes	Replace Apple Thunderbolt Cable (2.0 m). Verify issue resolved.	X26	EXTERNAL CABLE
	Is user's Thunderbolt cable damaged?	No	Go to step 13.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
13.	<p>Connect user's Apple Thunderbolt Cable (2.0 m) from user's computer to a known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer.</p> <p>Does known-good iMac become a target display for user's computer?</p>	Yes	Issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Replace Apple Thunderbolt Cable (2.0 m). Verify issue resolved.	X03	EXTERNAL CABLE
14.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID. Confirm current firmware version and link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Unstable Flickering

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Flickering video imageFlickering backlightDock and/or menu bar position not stableDisplay intermittently flashes on/offUnstable image <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.Check brightness setting.Check for and apply latest software and firmware updates, especially those that deal with display issues. Remember that some external Apple display adapters also contain firmware that may need updating. For more information, refer to the following articles:<ul style="list-style-type: none">HT201177: Apple computers: Troubleshooting issues with video on internal or external displaysHT201261: Intel-based iMac: Available updatesClean glass panel and check for dust or debris.Reset PRAM by holding down Command-Option-P-R keys while starting up until you hear the startup sound for the second time.Reset SMC using the procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC). <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with Power Supply Covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Adjust built-in display brightness setting to low backlight level, just above off.	Backlight	Go to step 2.	\$(nodeText.yesSymptomCode)	
	Verify whether user issue is due to backlight flickering or to an unstable or flickering video image on LCD.				
	You may need to shine a bright (low heat) flashlight onto front of LCD with computer powered ON to verify whether a faint video image is occasionally visible through the flickering.	Video	Go to step 8.	\$(nodeText.noSymptomCode)	
	Note: If video is present but backlight never turns on, exit this procedure and go to 'No Backlight' issue instead. Use this procedure only for flickering backlight or video image. Which is flickering, backlight or video?				
2.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace LCD panel with glass, which includes display power cable. Verify issue resolved.	L03	LCD
	Inspect display power cable and its connectors between logic board and LCD panel with glass.	No	Go to step 3.	\$(nodeText.noSymptomCode)	
	Is display power cable damaged?				
3.	Reseat display power cable between logic board and LCD panel with glass. Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer.	Yes	Issue resolved by reseating display power cable. Verify issue resolution.	\$(nodeText.yesSymptomCode)	
	CAUTION: Be extremely careful when working inside the computer while power is connected and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.				
	For additional safety information and tips, refer to articles:	No	Go to step 4.	\$(nodeText.noSymptomCode)	
	<ul style="list-style-type: none"> TP820: iMac (27-inch): Safety TP914: iMac (21.5-inch): Safety 				
	Is normal video restored?				

	Check	Result	Action	Code	Commodity
4.	To troubleshoot this issue completely, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD panel with glass?	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
		No	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
5.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good LCD panel with glass. Is normal video restored?	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Go to step 6.	\${nodeText.noSymptomCode}	
6.	To troubleshoot this issue completely, a known-good power supply is required. Do you have immediate access to a known-good power supply?	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Replace power supply. Verify issue resolved.	P99	POWER SUPPLY
7.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good power supply. Is normal video restored?	Yes	Replace power supply. Verify issue resolved.	P99	POWER SUPPLY
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

	Check	Result	Action	Code	Commodity
8.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.</p> <p>Is DisplayPort cable or its connector damaged?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 9.	\$(nodeText.noSymptomCode)	
9.	<p>Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.</p> <p>Is logic board cable connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 10.	\$(nodeText.noSymptomCode)	
10.	<p>Reseat DisplayPort cable between LCD panel and logic board. Connect power cord to computer, wait five seconds for SMC to become ready, then press power button to start up computer.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is connected and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 11.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
11.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to article TP981: iMac (27-inch): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
12.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 13.	\$(nodeText.noSymptomCode)	
13.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 14.	\$(nodeText.yesSymptomCode)	
		No	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
14.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass.</p> <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M29	MLB

	Check	Result	Action	Code	Commodity
15.	<p>Confirm that the computer display flickering or unstable video issue is resolved.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	

Audio-in Jack Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> External audio-in port does not work with an analog or digital line-level source <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> Press F12 key on keyboard to make sure that audio output is not muted. Ask user which type of audio input cable is connected to the computer's audio-in jack: analog or optical cable. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from recovery partition. See article HT201314: OS X: About OS X Recovery. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Update or restore if needed. Check that a known-good audio cable is used with its analog 3.5mm stereo miniplug end connected to proper input on computer and its other end connected to a compatible line-level audio source. Check that a known-good analog audio device (such as an iPod, iPhone, or Mac) is used as source and is playing audio. On user's computer, go to System Preferences > Sound and verify the following: <ul style="list-style-type: none"> Input tab: <ul style="list-style-type: none"> "Line In" input source is available and selected when an analog audio source is connected. "Input volume" slider is not set to zero (available only with an analog audio input). Output tab: <ul style="list-style-type: none"> Sound output device is set to Internal Speakers. Output volume is not muted or set to zero. Open QuickTime Player. Choose "New Audio Recording" from File menu. Choose "Built-in Input: Line In" input source from right pop-up menu and adjust sound volume using slider in center of window. If audio is heard, then verify user's cable and audio device using same process. Note: Disconnecting an analog stereo miniplug cable from the iPod/iPhone side will pause audio playback. Perform visual and mechanical inspection of audio input and output jacks. Use an otoscope to inspect for dust and/or debris. Use compressed air to clean and remove any dust and/or debris. Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear the startup sound a second time. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> TP833: iMac and Displays: Power Supply Cover Instructions TP820: iMac (27-inch): Safety TP914: iMac (21.5-inch): Safety

	Check	Result	Action	Code	Commodity
1.	Play a known-good audio file or reliable Internet radio station via iTunes. Verify that sound is clearly audible and free of distortion through both headphones and internal speakers. Does the audio file play correctly?	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	Go to step 2.	\${nodeText.noSymptomCode}	
2.	Specify whether playback from known-good audio source is distorted or not audible. Is sound distorted or not audible?	Distorted	Go to “Distorted Audio from Internal Speaker(s)” troubleshooting flow.	\${nodeText.yesSymptomCode}	
		Not Audible	Go to “No Audio from Internal Speaker(s) or Headphone Jack” troubleshooting flow.	\${nodeText.noSymptomCode}	
3.	Hold down Command-R during startup to restart from recovery partition, and try to reproduce audio input issue using known-good audio sources and cables. Does audio issue persist with known-good OS?	Yes	Go to step 4.	\${nodeText.yesSymptomCode}	
		No	Restore OS with correct OS X build, see article HT204319: OS X versions and builds included with Mac computers . Verify issue resolution.	\${nodeText.noSymptomCode}	
4.	From user information, identify whether analog line-in or optical digital-in is causing issue. Which audio input is affected: analog line-in or optical digital-in?	Analog Line-in	Go to step 5.	\${nodeText.yesSymptomCode}	
		Optical Digital-in	Go to step 10.	\${nodeText.noSymptomCode}	
5.	To troubleshoot this issue completely, a known-good 3.5mm stereo cable is required. Do you have immediate access to a known-good 3.5mm stereo cable?	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Computer analog input cannot be tested without adequate 3.5mm male-to-male stereo miniplug cable. See article PH19106: Audio ports for further information.	\${nodeText.noSymptomCode}	
6.	Disconnect any cable from audio in (mic) port to verify default setting for audio in. In System Preferences > Sound > Input, verify that the Line In audio input source is listed and that the Input volume slider is present. Set Input volume to middle position. Is Line In audio input available?	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	Go to step 7.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
7.	<p>Line-in activity appears to be stuck to optical digital-in mode:</p> <ul style="list-style-type: none"> • Insert a 3.5mm stereo miniplug into the audio in port and then rapidly unplug it and plug it in several times to reset internal switches in the connector. • Verify whether System Preferences > Sound > Input reverts to Line In after plug insertion and removal. • Close and reopen Sound Preferences window to refresh list of current audio input sources. <p>Does audio input in System Preferences revert to Line In after minijack insertion and removal?</p>	Yes	Issue resolved by resetting audio-in jack. To prevent the issue from recurring suggest that user check physical specifications of cable connectors previously connected to this jack.	#{nodeText.yesSymptomCode}	
		No	Go to step 14.	#{nodeText.noSymptomCode}	
8.	<p>Play a known-good audio file or Internet radio station in iTunes, and verify that it plays through internal speakers.</p> <p>Connect 3.5mm male-to-male stereo miniplug cable between the audio in (mic) port and the audio out (headphone) port.</p> <p>In System Preferences > Sound > Output verify that Headphones audio output source appears and select it.</p> <p>In System Preferences > Sound > Input, select Line In, then adjust the Input volume slider to observe activity level without peaking at maximum.</p> <p>Does the bar graph at bottom of recording window show input activity?</p>	Yes	Go to step 9.	#{nodeText.yesSymptomCode}	
		No	Go to step 14.	#{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
9.	Open QuickTime Player and choose New Audio Recording from File menu.	Yes	Computer analog audio input appears to be performing to specifications. Verify issue resolved.	\$_{nodeText.yesSymptomCode}	
	<p>In the new recording window, choose "Built-In: Line Input" source from input source right pop-up menu. Adjust volume using slider in center of window.</p> <p>Press record button to start recording. Record for several seconds, then click record button again to stop recording.</p> <p>Disconnect stereo cable from audio out (headphone) port to hear audio through internal speakers. If needed, press F11-F12 keys to adjust volume, and confirm that computer is able to play sound.</p> <p>Stop playing known-good audio file or Internet radio.</p> <p>Play recorded audio file.</p> <p>Does computer accurately reproduce sound recorded from audio input?</p>	No	Go to step 14.	\$_{nodeText.noSymptomCode}	
10.	<p>To troubleshoot this issue completely, a known-good 3.5mm mini-TOSLINK optical cable is required.</p> <p>Do you have immediate access to a known-good 3.5mm mini-TOSLINK cable?</p>	Yes	Go to step 11.	\$_{nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Computer digital input cannot be tested without adequate 3.5mm mini-TOSLINK male-to-male optical cable. See article PH19106: Audio ports for further information.</p>	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
11.	Connect 3.5mm mini-TOSLINK cable to the audio out (headphone) port.	Yes	Go to step 12.	\$_{nodeText.yesSymptomCode}\$	
	<p>In System Preferences > Sound > Output, verify that a Digital Out audio output source appears, and select it.</p> <p>Play a known-good audio file or Internet radio station.</p> <p>Audio out should switch to optical digital audio, and unplugged end of cable will emit a red light to indicate transmission of a digital audio stream.</p> <p>Is red light visible at unplugged end of mini-TOSLINK cable?</p>	No	Go to step 14.	\$_{nodeText.noSymptomCode}\$	
12.	Continue to play known-good audio.	Yes	Go to step 13.	\$_{nodeText.yesSymptomCode}\$	
	<p>Connect other end of 3.5mm mini-TOSLINK cable to audio in (mic) port.</p> <p>Open QuickTime Player and choose New Audio Recording from File menu.</p> <p>In the new recording window, choose "Built-in Input: Digital In" from the input source pop-up menu, and adjust volume using slider in center of window.</p> <p>Does the bar graph at bottom of the recording window show input activity?</p>	No	Go to step 14.	\$_{nodeText.noSymptomCode}\$	
13.	Press record button to start recording. Record for several seconds. Press record button again to stop recording.	Yes	Computer digital audio input appears to be performing to specifications. Verify issue resolved.	\$_{nodeText.yesSymptomCode}\$	
	<p>Disconnect optical cable from audio out (headphone) port to hear audio through internal speakers. Press F11 and F12 keys to adjust volume, and confirm that computer is able to play sound.</p> <p>Stop playing known-good audio.</p> <p>Play the recorded audio file.</p> <p>Does computer accurately reproduce sound recorded from audio input?</p>	No	Go to step 14.	\$_{nodeText.noSymptomCode}\$	

	Check	Result	Action	Code	Commodity
14.	Disconnect cable from audio in (mic). Open QuickTime Player and choose New Audio Recording from the File menu. Choose "Built-in Microphone: Internal Microphone" from the pop-up menu to record from an internal microphone input source. Compare distortion between recorded internal input and external input sources. Is recorded sound also distorted when recorded from internal microphone input?	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 15.	\${nodeText.noSymptomCode}	
15.	Disconnect headphones or external speakers. Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding. Remove LCD panel with glass. Inspect audio cable connector and its corresponding connector on logic board. Reseat connection and retest. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Is recorded sound audible, clear, and free of distortion?	Yes	Issue resolved by reseating audio cable. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	Go to step 16.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
16.	<p>To troubleshoot this issue completely, a known-good rear enclosure is required.</p> <p>Do you have immediate access to a known-good rear enclosure?</p>	Yes	Go to step 17.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
17.	<p>Substitute a known-good rear enclosure with audio ports and retest recording.</p> <p>To do this, carefully place known-good rear enclosure near the user's computer, then temporarily plug audio flex cable from known-good rear enclosure into audio connector on the logic board inside user's computer.</p> <p>Is recorded sound audible, clear, and free of distortion?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
			Replace logic board. Verify issue resolved.	M09	MLB
		No			

	Check	Result	Action	Code	Commodity
18.	Plug a known-good analog audio source into audio in jack, and verify that sound recorded is audible and free of distortion. Repeat with digital (optical) audio source. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Camera Issues

Unlikely causes:

Battery, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Camera not detected• No green LED for camera• Excessive blooming• Poor white balance• Poor focus• Green image• Image distortion <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply latest software and firmware updates.2. Refer to article HT204319: OS X versions and builds included with Mac computers. Verify that correct version of OS X is installed.3. Verify that camera lens and glass panel are clean and clear of contaminants.4. Ask user about lighting conditions in his or her working environment. Dim lighting causes poor image quality. Overly bright lighting can bounce off surfaces onto subject and make image foggy.5. Striped, textured, and mesh clothing can create moiré patterns in image.6. Reset SMC using procedure for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).7. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.8. Disconnect all USB devices and restart. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) and check test results to verify camera presence.	Yes	Go to step 3.	<code>\${nodeText.yesSymptomCode}</code>	
	Does MRI detect the camera and LCD display panel?	No	Go to step 2.	<code>\${nodeText.noSymptomCode}</code>	

	Check	Result	Action	Code	Commodity
2.	Depending on computer model, the camera will be listed in System Information > Hardware > USB or Camera Device Tree. Verify that "FaceTime HD Camera (Internal)" is listed. Does the camera appear in System Information?	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 4.	`\${nodeText.noSymptomCode}`	
3.	Launch Photo Booth. Verify that green LED next to camera lights up. Make sure image looks normal. Does the camera LED light up and the image appear normal?	Yes	Issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 4.	`\${nodeText.noSymptomCode}`	
4.	Check camera/microphone/ALS cable connection to camera and to logic board. Check cable connectors to camera and logic board for loose or broken wires or pins. Does camera cable show any signs of damage?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 5.	`\${nodeText.noSymptomCode}`	
5.	Inspect camera cable connector on logic board, looking for a missing connector, cracking housing, or bent or broken pins that may have lifted from logic board solder pads. Does logic board connector show any signs of damage?	Yes	Replace logic board. Verify issue resolved.	M13	MLB
		No	Go to step 6.	`\${nodeText.noSymptomCode}`	
6.	Reseat camera cable securely to logic board. Check System Information again. Does camera appear in System Information?	Yes	Go to step 7.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 8.	`\${nodeText.noSymptomCode}`	
7.	Launch Photo Booth. Verify that green LED next to camera lights up. Make sure image looks normal. Does camera LED light up and image appear normal?	Yes	Issue resolved by reseating the camera/microphone/ALS cable. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 10.	`\${nodeText.noSymptomCode}`	
8.	To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required. Do you have immediate access to a known-good camera/microphone/ALS cable?	Yes	Go to step 9.	`\${nodeText.yesSymptomCode}`	
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE

	Check	Result	Action	Code	Commodity
9.	Substitute a known-good camera/microphone/ALS cable and retest.	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
	Is camera working normally?	No	Go to step 10.	\${nodeText.noSymptomCode}	
10.	To troubleshoot this issue completely, a known-good camera is required.	Yes	Go to step 11.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good camera?	No	Replace camera. Verify issue resolved.	X21	OTHER ELECTRIC
11.	Substitute a known-good camera and retest.	Yes	Replace camera. Verify issue resolved.	X21	OTHER ELECTRIC
	Is camera working normally?	No	Go to step 12.	\${nodeText.noSymptomCode}	
12.	To troubleshoot this issue completely, a known-good logic board is required.	Yes	Go to step 13.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good logic board?	No	Replace logic board. Verify issue resolved.	M13	MLB
13.	Substitute a known-good logic board and retest. Is camera working normally?	Yes	Replace logic board. Verify issue resolved.	M13	MLB
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

Distorted Audio from Internal Speaker(s)

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, memory, power supply, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Sound is distorted, fuzzy, crackly, etc.• Symptom only appears in internal speaker.• Symptom also appears in external speakers/headphones. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Test with known-good sound file.2. Compare same sound and settings against a known-good similar model computer to make sure sound is indeed distorting.3. In System Preferences > Sound > Output, adjust the Output volume and use Balance slider to isolate left and right speakers. Check whether issue only happens with one speaker.4. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.5. If testing with iTunes, make sure both equalizer and preamp settings are set to Flat.6. Test audio output using more than one application or website.7. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using known-good, up-to-date, bootable OS X volume. Play same known-good sound file and compare using internal speakers and known-good headphones or external speakers.	Yes	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall the correct OS X build. Verify resolution.	\${nodeText.yesSymptomCode}	
	Is internal/external sound now audible, clear, and free of distortion?	No	Go to step 2.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
2.	Play known-good audio file on internal speakers, then connect known-good headphones or external speakers and compare for distortion. Is sound also distorted through headphones or external speakers?	Yes	Go to step 3.	$\{nodeText.yesSymptomCode\}$	
		No	Go to step 6.	$\{nodeText.noSymptomCode\}$	
3.	Disconnect headphones or external speakers. Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding. Remove LCD panel with glass. Inspect audio cable connector and its corresponding connector on logic board. Reseat connection and retest. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Is sound from internal/external speakers audible, clear, and free of distortion?	Yes	Issue resolved by reseating audio cable. Verify resolution.	$\{nodeText.yesSymptomCode\}$	
		No	Go to step 4.	$\{nodeText.noSymptomCode\}$	

	Check	Result	Action	Code	Commodity
4.	<p>To troubleshoot this issue completely, a known-good rear enclosure is required.</p> <p>Do you have immediate access to a known-good rear enclosure?</p>	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
5.	<p>Substitute a known-good rear enclosure with audio ports and retest.</p> <p>To do this, carefully place known-good rear enclosure near user's computer, then temporarily plug audio flex cable from known-good rear enclosure into audio connector on logic board inside user's computer.</p> <p>Is sound from internal/external speakers audible, clear, and free of distortion?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
6.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Issue resolved by reseating speaker cable connection. Verify resolution.	\${nodeText.yesSymptomCode}	
	Remove LCD panel with glass. Locate affected speaker connection on logic board. Inspect speaker cable connector and its corresponding connector on logic board. Reseat connection and retest. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Is sound from affected internal speaker audible, clear, and free of distortion?	No	Go to step 7.	\${nodeText.noSymptomCode}	
7.	Disconnect headphones or external speakers. In System Preferences > Sound > Output, move Balance slider all the way left then all the way right, testing sound output each time. Test full range of volume settings.	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
	Listen closely to higher range tones to determine whether both left and right speakers are achieving proper stereo playback and separation between channels. Does distortion issue affect both speakers?	No	Go to step 10.	\${nodeText.noSymptomCode}	
8.	Remove LCD panel with glass. To troubleshoot this issue completely, a known-good (left or right) internal speaker is required.	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good speaker?	No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
9.	Substitute a known-good speaker and retest. Is sound from known-good internal speaker audible, clear, and free of distortion?	Yes	Replace user's affected speaker. Verify issue resolved. Remember, if you are replacing the speakers on a Late 2012 model or later, speakers need to be replaced together as a pair.	X09	OTHER ELECTRIC
		No	Reinstall user's speaker. Replace logic board. Verify issue resolved.	M09	MLB
10.	Inspect and carefully clean affected speaker cone using a soft tissue to remove dust, debris, or foreign material such as metal fragments that easily adhere to the magnetic speaker. Reseat speaker connection and retest. Is sound from affected speaker audible, clear, and free of distortion?	Yes	Issue resolved by cleaning the speaker membrane. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 11.	\$(nodeText.noSymptomCode)	
11.	To troubleshoot this issue completely, a known-good speaker is required. Do you have immediate access to a known-good speaker?	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	Replace user's affected speaker. Verify issue resolved. Remember, if you are replacing the speakers on a Late 2012 model or later, speakers need to be replaced together as a pair.	X09	OTHER ELECTRIC
12.	Substitute a known-good speaker and retest. Is sound from affected speaker audible, clear, and free of distortion?	Yes	Replace user's affected speaker. Verify issue resolved. Remember, if you are replacing the speakers on a Late 2012 model or later, speakers need to be replaced together as a pair.	X09	OTHER ELECTRIC
		No	Replace logic board. Reinstall user's speaker. Verify issue resolved.	M09	MLB
13.	Connect and disconnect external speakers/headphones, verifying that audio can be played from both external and internal speakers and that computer produces a clear, distortion-free sound. Is the issue resolved?	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

External Apple Bluetooth Peripherals

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Apple Bluetooth wireless keyboard, mouse, or trackpad is not recognized by known-good computerApple Bluetooth wireless keyboard, mouse, or trackpad will not pair with known-good computerApple Bluetooth wireless keyboard, mouse, or trackpad intermittently loses its connectionApple wireless keyboard has one or more of the following issues:<ul style="list-style-type: none">No powerBattery will not charge (for peripherals with embedded batteries)Swollen battery (for peripherals with embedded batteries)Battery runtime too shortWill not turn offSpecific key(s) do not workKeys seem to stick, do not respond properly, or respond slowlyWrong keyboard languageKeys missing or falling off keyboardPaint is wearing off of one or more keys on the keyboardPhysical and/or cosmetic issuesApple wireless mouse has one or more of the following issues:<ul style="list-style-type: none">No powerBattery will not charge (for peripherals with embedded batteries)Swollen battery (for peripherals with embedded batteries)Battery runtime too shortWill not turn offNo mouse responseMouse click not recognizedMouse causes erratic cursor trackingPhysical and/or cosmetic issuesApple wireless trackpad has one or more of the following issues:<ul style="list-style-type: none">No powerBattery will not charge (for peripherals with embedded batteries)Swollen battery (for peripherals with embedded batteries)Battery runtime too shortWill not turn offNo trackpad responseTrackpad click not recognizedTrackpad causes erratic cursor trackingTrackpad requires high click forceTrackpad click overly sensitiveForce Touch or haptic feedback issuePhysical and/or cosmetic issues <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>IMPORTANT: This troubleshooting procedure is intended only for Apple Bluetooth wireless peripheral devices, such as the following Apple products:</p> <ul style="list-style-type: none">Magic Mouse or Magic Mouse 2Magic Trackpad or Magic Trackpad 2Apple Wireless Keyboard or Magic Keyboard <p>For simplicity, this procedure refers to these products as wireless mouse, wireless trackpad, and wireless keyboard unless otherwise noted.</p> <p>For third-party devices, contact the manufacturer for support, software/firmware updates, or service options.</p> <ol style="list-style-type: none">Check for and apply the latest software and firmware updates.In System Preferences, make sure Bluetooth is on and set to Discoverable.For Apple Bluetooth peripherals with replaceable batteries, such as the Magic Mouse, Magic Trackpad, or Apple Wireless Keyboard: If the device does not turn on, then install new or freshly charged batteries.For Apple Bluetooth peripherals with embedded batteries, such as the Magic Mouse 2, Magic Trackpad 2, or Magic Keyboard: If the device does not turn on, then connect a known-good USB Power Adapter and Lightning cable to the device to charge it for at least two minutes. Switching the device power button or switch to the ON position will allow the device to charge more quickly than when OFF.For Apple Bluetooth peripherals with embedded batteries such as the Magic Mouse 2, Magic Trackpad 2, or Magic Keyboard, verify that the computer being used with the peripheral supports Bluetooth 4.0 or later. Computers with earlier versions of Bluetooth support will not pair with Apple Bluetooth peripherals with embedded batteries.Attempt to pair user's Bluetooth device with known-good computer, using article HT204621: Troubleshooting wireless mouse and keyboard issues.Reset Bluetooth device or delete pairing (if applicable).If Bluetooth pairs normally at your service location, then research potential sources of interference in the user's environment, such as microwave ovens or cordless phones in the 2.4/5GHz range. See article HT201542: Potential sources of Wi-Fi and Bluetooth interference.Magic Mouse 2, Magic Trackpad 2, and Magic Keyboard, can pair with the computer using either Bluetooth or a Lightning cable. If Bluetooth pairing is not possible due to interference or other reasons, then try pairing these products by connecting them to the known-good computer with a known-good Lightning cable.For keyboard issues, refer to HT204540: If your wireless or USB keyboard doesn't work for troubleshooting tips.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Visually inspect the user's wireless mouse, wireless trackpad, or wireless keyboard for any for physical, cosmetic, and/or liquid damage.</p> <p>On a wireless mouse or wireless trackpad, verify that the mouse or trackpad button clicks.</p> <p>On keyboards, verify that all keyboard buttons are present and can be depressed normally.</p> <p>Does the user's wireless mouse, wireless trackpad, or wireless keyboard show signs of damage?</p>	Yes	Go to step 2.	\${nodeText.yesSymptomCode}	
		No	Go to step 11.	\${nodeText.noSymptomCode}	
2.	<p>Determine whether there is a safety issue, such as fumes, excessive heat, or shock.</p> <p>Do not perform procedures that can be a safety risk to you or the user.</p> <p>Can you proceed safely?</p>	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support regarding safety procedures for this product.</p>	\${nodeText.noSymptomCode}	
3.	<p>Isolate damage issue to either user's wireless keyboard, or wireless mouse or trackpad.</p> <p>Which peripheral is damaged?</p>	Wireless keyboard	Go to step 4.	\${nodeText.yesSymptomCode}	
		Wireless mouse or trackpad	Go to step 8.	\${nodeText.noSymptomCode}	
4.	<p>Closely examine the user's device to determine exact nature of the issue.</p> <p>Look for any signs of liquid spill, liquid penetration, or liquid damage to device.</p> <p>Is damage to user's device related to liquid spill?</p>	Yes	Replace the user's wireless keyboard out of warranty.	K90	KEYBOARD
		No	Go to step 5.	\${nodeText.noSymptomCode}	
5.	<p>Closely examine the user's device for any signs of physical damage that may affect operation.</p> <p>Does the user's device exhibit this symptom?</p>	Yes	Replace the user's wireless keyboard out of warranty.	K16	KEYBOARD
		No	Go to step 6.	\${nodeText.noSymptomCode}	
6.	<p>Closely examine the user's device for signs of paint wearing off of one or more keys.</p> <p>Does the user's keyboard exhibit this symptom?</p>	Yes	Replace the user's wireless keyboard out of warranty.	K35	KEYBOARD
		No	Go to step 7.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
7.	Closely examine the user's device for any signs of cosmetic damage that does not affect operation.	Yes	Replace the user's wireless keyboard out of warranty.	K21	KEYBOARD
	Does the user's device exhibit this symptom?	No	Issue cannot be duplicated.	\$(nodeText.noSymptomCode)	
8.	Closely examine the user's device to determine exact nature of the issue.	Yes	Replace the user's wireless mouse or wireless trackpad out of warranty.	K90	MOUSE
	Look for any signs of liquid spill, liquid penetration, or liquid damage to device.	No	Go to step 9.	\$(nodeText.noSymptomCode)	
	Is damage to user's device related to liquid spill?				
9.	Closely examine the user's device for any signs of physical damage that may affect operation.	Yes	Replace the user's wireless mouse or wireless trackpad out of warranty.	K16	MOUSE
	Does the user's device exhibit this symptom?	No	Go to step 10.	\$(nodeText.noSymptomCode)	
10.	Closely examine the user's device for any signs of cosmetic damage that does not affect operation.	Yes	Replace the user's wireless mouse or wireless trackpad out of warranty.	K21	MOUSE
	Does the user's device exhibit this symptom?	No	Issue cannot be duplicated.	\$(nodeText.noSymptomCode)	
11.	Test the user's wireless mouse, wireless trackpad, or wireless keyboard with latest version of Bluetooth Service Diagnostic . If a fault is detected, then record the Diagnostic Receipt Code .	Yes	ESCALATION REQUIRED.	\$(nodeText.yesSymptomCode)	
	Refer to article OP52: Bluetooth Keyboard, Mouse and Magic Trackpad Screening Process to identify the fault reported by Bluetooth Service Diagnostic.		The Bluetooth device appears to be performing to specifications. There may be an issue with the user's computer, or wireless interference in user's environment.		
	If Bluetooth Service Diagnostic is not available, then test the user's wireless mouse, wireless trackpad, or wireless keyboard manually, using built-in applications on a known-good computer. For example, use the Notes application to check the keys on a wireless keyboard.	No	Go to step 12.	\$(nodeText.noSymptomCode)	
	Does the user's wireless mouse, wireless trackpad, or wireless keyboard pass all tests?				
12.	Isolate failure to either user's wireless keyboard, or wireless mouse or trackpad.	Wireless keyboard	Go to step 13.	\$(nodeText.yesSymptomCode)	
	Which peripheral is malfunctioning?	Wireless mouse or trackpad	Go to step 29.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
13.	Look for for any signs of power on the user's wireless keyboard, such as a power LED turning on. Note: Not all devices have a power LED.	Yes	Go to step 14.	\$(nodeText.yesSymptomCode)	
	Verify that the user's wireless keyboard turns ON when the power button or switch is placed in the ON position. Verify that the user's wireless keyboard turns OFF when the power button or switch is placed in the OFF position. Does the user's wireless keyboard exhibit any power-related symptoms?	No	Go to step 18.	\$(nodeText.noSymptomCode)	
14.	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard is not functioning at all (seems dead, no power, power LED does not turn on) 	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K09	KEYBOARD
	Does the user's wireless keyboard exhibit this symptom?	No	Go to step 15.	\$(nodeText.noSymptomCode)	
15.	Verify that the user's wireless keyboard turns ON when the power button or switch is placed in the ON position. Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Power switch or button is defective 	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K19	KEYBOARD
	Does the user's wireless keyboard exhibit this symptom?	No	Go to step 16.	\$(nodeText.noSymptomCode)	
16.	Verify that the user's wireless keyboard turns off when the power button or switch is placed in the OFF position. Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard remains ON when power button or switch has been placed in the OFF position 	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K34	KEYBOARD
	Does the user's wireless keyboard exhibit this symptom?	No	Go to step 17.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
17.	Verify if the user's wireless keyboard has any other power-related issue that is not related to the power button or switch.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K20	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Power Issue, not due to power button or switch Does the user's wireless keyboard exhibit this symptom?	No	Go to step 18.	\${nodeText.noSymptomCode}	
18.	If the user's issue involves pairing or connecting to a Magic Keyboard, then you can connect to, pair, and use this device with the computer using either Bluetooth or a Lightning cable.	Yes	Go to step 19.	\${nodeText.yesSymptomCode}	
	If Bluetooth pairing is not possible due to interference or other reasons, then try connecting the user's Magic Keyboard to the known-good computer with a known-good Lightning cable. For other Apple Bluetooth peripherals, select the "Yes" answer to continue. Does the user's Magic Keyboard connect and pair using USB?	No	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K30	KEYBOARD
19.	Verify that a known-good computer can recognize the user's wireless keyboard.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K15	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard is not recognized by known-good computer Does the user's wireless keyboard exhibit this symptom?	No	Go to step 20.	\${nodeText.noSymptomCode}	
20.	Verify that a known-good computer can pair with the user's wireless keyboard using Bluetooth.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K07	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard cannot pair with a known-good computer Does the user's wireless keyboard exhibit this symptom?	No	Go to step 21.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
21.	Verify that a known-good computer maintains a Bluetooth connection to the user's wireless keyboard, and does not drop this connection.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K08	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard intermittently loses its connection with a known-good computer Does the user's wireless keyboard exhibit this symptom?	No	Go to step 22.	\${nodeText.noSymptomCode}	
22.	Ask the user how often and how long the wireless keyboard is used.	Yes	Go to step 23.	\${nodeText.yesSymptomCode}	
	Explain to the user that the battery issue could likely be caused by the user using the wireless keyboard continuously over a long period of time, rather than any fault of the wireless keyboard itself, OS X, or the user's computer. Gain agreement from the user that lengthy wireless keyboard usage is likely to be the cause of the battery life issue, and that there is no service issue with the wireless keyboard itself. Does the user agree that the battery life issue is likely caused by lengthy wireless keyboard usage?	No	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K32	KEYBOARD
23.	Attempt to charge the user's wireless keyboard battery for several more minutes. Verify that the user's wireless keyboard battery charge level that appears on the known-good computer that is paired with this user's wireless keyboard has increased and shows that the user's wireless keyboard is charging.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K31	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard battery will not charge Note: This symptom does not apply to peripherals with replaceable batteries. Does the user's wireless keyboard exhibit this symptom?	No	Go to step 24.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
24.	Closely inspect the user's wireless keyboard enclosure for signs of a swollen battery.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K33	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> User's wireless keyboard battery appears swollen Note: This symptom does not apply to peripherals with replaceable batteries.				
25.	Verify that each and every wireless keyboard key functions as expected when pressed and released.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K01	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Specific key(s) do not work Does the user's wireless keyboard exhibit this symptom?		Go to step 25.	\$(nodeText.noSymptomCode)	
26.	Verify that each and every wireless keyboard key functions as expected when pressed and released.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K05	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Keys seem to stick, do not respond properly, or respond slowly Does the user's wireless keyboard exhibit this symptom?		Go to step 26.	\$(nodeText.noSymptomCode)	
27.	Verify that each and every wireless keyboard key is intact and not missing.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K27	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Keys missing or falling off keyboard Does the user's wireless keyboard exhibit this symptom?		Go to step 27.	\$(nodeText.noSymptomCode)	
28.	Verify that the wireless keyboard language is as expected.	Yes	Replace the user's wireless keyboard. Enter Diagnostic Receipt Code as required if available.	K04	KEYBOARD
	Confirm that the issue with the user's wireless keyboard is: <ul style="list-style-type: none"> Wrong keyboard language version Does the user's wireless keyboard exhibit this symptom?		Go to step 28.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
29.	Look for for any signs of power on the user's wireless mouse or trackpad, such as a power LED turning on. Note: Not all devices have a power LED.	Yes	Go to step 30.	\${nodeText.yesSymptomCode}	
	Verify that the user's wireless mouse or trackpad turns ON when the power button or switch is placed in the ON position.	No	Go to step 34.	\${nodeText.noSymptomCode}	
	Verify that the user's wireless mouse or trackpad turns OFF when the power button or switch is placed in the OFF position.				
	Does the user's wireless mouse or trackpad exhibit any power-related symptoms?				
30.	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> User's wireless mouse or trackpad is not functioning at all (seems dead, no power, power LED does not turn on) 	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K09	MOUSE
	Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 31.	\${nodeText.noSymptomCode}	
31.	Verify that the user's wireless mouse or trackpad turns ON when the power button or switch is placed in the ON position.	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K19	MOUSE
	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> Power switch or button is defective 				
	Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 32.	\${nodeText.noSymptomCode}	
32.	Verify that the user's wireless mouse or trackpad turns off when the power button or switch is placed in the OFF position.	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K34	MOUSE
	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> User's wireless mouse or trackpad remains ON when power button or switch has been placed in the OFF position 				
	Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 33.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
33.	Verify if the user's wireless mouse or trackpad has any other power-related issue that is not related to the power button or switch.	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K20	MOUSE
	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> Power Issue, not due to power button or switch Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 34.	\${nodeText.noSymptomCode}	
34.	If the user's issue involves pairing or connecting to a Magic Mouse 2 or Magic Trackpad 2, then you can connect to and pair these devices with a computer using either Bluetooth or a Lightning cable. If Bluetooth pairing is not possible due to interference or other reasons, then try connecting the user's Magic Mouse 2 or Magic Trackpad 2 to a known-good computer with a known-good Lightning cable. For other Apple Bluetooth peripherals, select the "Yes" answer to continue. Does the user's Magic Mouse 2 or Magic Trackpad 2 connect and pair using USB?	Yes	Go to step 35.	\${nodeText.yesSymptomCode}	
		No	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K30	MOUSE
35.	Verify that a known-good computer can recognize the user's wireless mouse or trackpad. Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> User's wireless mouse or trackpad is not recognized by known-good computer Does the user's wireless mouse or trackpad exhibit this symptom?	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K15	MOUSE
		No	Go to step 36.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
36.	Verify that a known-good computer can pair with the user's wireless mouse or trackpad.	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K07	MOUSE
	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> User's wireless mouse or trackpad cannot pair with a known-good computer Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 37.	\${nodeText.noSymptomCode}	
37.	Verify that a known-good computer maintains a Bluetooth connection to the user's wireless mouse or trackpad, and does not drop this connection.	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K08	MOUSE
	Confirm that the issue with the user's wireless mouse or trackpad is: <ul style="list-style-type: none"> User's wireless mouse or trackpad intermittently loses its connection with a known-good computer Does the user's wireless mouse or trackpad exhibit this symptom?	No	Go to step 38.	\${nodeText.noSymptomCode}	
38.	Ask the user how often and how long the wireless mouse or trackpad is used.	Yes	Go to step 39.	\${nodeText.yesSymptomCode}	
	Gain agreement from the user that lengthy wireless mouse or trackpad usage is likely to be the cause of the battery life issue, and that there is no service issue with the wireless mouse or trackpad itself. Does the user agree that the battery life issue is likely due to lengthy wireless device usage?	No	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K32	MOUSE

	Check	Result	Action	Code	Commodity
39.	<p>Attempt to charge the user's wireless mouse or trackpad battery for several more minutes. Verify that the user's wireless mouse or trackpad battery charge level that appears on the known-good computer that is paired with this user's wireless mouse or trackpad has increased and shows that the user's wireless mouse or trackpad is charging.</p> <p>Confirm that the issue with the user's wireless mouse or trackpad is:</p> <ul style="list-style-type: none"> User's wireless mouse or trackpad battery will not charge <p>Note: This symptom does not apply to peripherals with replaceable batteries.</p> <p>Does the user's wireless mouse or trackpad exhibit this symptom?</p>	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K31	MOUSE
		No	Go to step 40.	\${nodeText.noSymptomCode}	
40.	<p>Closely inspect the user's wireless mouse or trackpad enclosure for signs of a swollen battery.</p> <p>Confirm that the issue with the user's wireless mouse or trackpad is:</p> <ul style="list-style-type: none"> User's wireless mouse or trackpad battery appears swollen <p>Note: This symptom does not apply to peripherals with replaceable batteries.</p> <p>Does the user's wireless mouse or trackpad exhibit this symptom?</p>	Yes	Replace the user's wireless mouse or trackpad. Enter Diagnostic Receipt Code as required if available.	K33	MOUSE
		No	Go to step 41.	\${nodeText.noSymptomCode}	
41.	<p>Isolate failure to either user's wireless mouse or wireless trackpad.</p> <p>Which peripheral is malfunctioning?</p>	Wireless mouse	Go to step 42.	\${nodeText.yesSymptomCode}	
		Wireless trackpad	Go to step 45.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
42.	Verify that the overall function of the user's wireless mouse performs as expected when used with the known-good computer.	Yes	Replace the user's wireless mouse. Enter Diagnostic Receipt Code as required if available.	K26	MOUSE
	Confirm that the issue with the user's wireless mouse is: <ul style="list-style-type: none"> No mouse response Does the user's wireless mouse exhibit this symptom?	No	Go to step 43.	\${nodeText.noSymptomCode}	
43.	Verify that the clicking function of the user's wireless mouse performs as expected when pressed and released.	Yes	Replace the user's wireless mouse. Enter Diagnostic Receipt Code as required if available.	K14	MOUSE
	Confirm that the issue with the user's wireless mouse is: <ul style="list-style-type: none"> Mouse clicking function not working properly Does the user's wireless mouse exhibit this symptom?	No	Go to step 44.	\${nodeText.noSymptomCode}	
44.	Verify that the touch gesture function of the user's wireless mouse performs as expected when the mouse surface is touched.	Yes	Replace the user's wireless mouse. Enter Diagnostic Receipt Code as required if available.	K18	MOUSE
	Confirm that the issue with the user's wireless mouse is: <ul style="list-style-type: none"> Touch/Multi-Touch gesture issue Does the user's wireless mouse exhibit this symptom?	No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	
45.	Verify that the overall function of the user's wireless trackpad performs as expected when used with the known-good computer.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K23	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad cursor not responding Does the user's wireless trackpad exhibit this symptom?	No	Go to step 46.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
46.	Verify that the user's wireless trackpad exhibits smooth continuous tracking when used with the known-good computer, and does not skip or behave erratically.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K12	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad cursor not tracking properly Does the user's wireless trackpad exhibit this symptom?	No	Go to step 47.	\${nodeText.noSymptomCode}	
47.	Verify that the clicking function of the user's wireless trackpad performs as expected when pressed and released, and that the click is recognized by the known-good computer.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K13	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad click not recognized Does the user's wireless trackpad exhibit this symptom?	No	Go to step 48.	\${nodeText.noSymptomCode}	
48.	Verify that the user's wireless trackpad clicking function does not require excessive force when pressed and released.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K24	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad requires high click force Does the user's wireless trackpad exhibit this symptom?	No	Go to step 49.	\${nodeText.noSymptomCode}	
49.	Verify that the user's wireless trackpad clicking function is not overly sensitive to clicking when pressed and released.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K25	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad click oversensitive Does the user's wireless trackpad exhibit this symptom?	No	Go to step 50.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
50.	Verify that the user's wireless trackpad Force Touch function performs as expected and that haptic feedback is felt in response. Note: This feature does not apply to all models.	Yes	Replace the user's wireless trackpad. Enter Diagnostic Receipt Code as required if available.	K29	MOUSE
	Confirm that the issue with the user's wireless trackpad is: <ul style="list-style-type: none"> Trackpad Force Touch or haptic feedback issue 	No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	
	Does the user's wireless trackpad exhibit this symptom?				

External Apple Wired Keyboard and Mouse

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<p>Apple wired USB keyboard or mouse does not function with user's computer, or shows one or more of the following symptoms:</p> <ul style="list-style-type: none">• Mouse button(s) does not click• Mouse scroll ball does not operate smoothly• No mouse response• Keyboard keys stick• Keyboard keys loose or missing• One or more keys do not respond when pressed• No keyboard response at all• Apple wired mouse causes erratic cursor tracking• Apple wired keyboard or mouse is not recognized• Apple wired keyboard or mouse has physical damage that affects operation• Paint is wearing off of one or more keys on the keyboard• Apple wired keyboard or mouse has cosmetic damage that does not affect operation <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Try steps suggested in article PH19094: OS X Yosemite: If a USB device isn't working.2. Disconnect all USB devices from user's computer except user's mouse or keyboard. Troubleshoot only one device at a time to help isolate issue.3. Unplug the keyboard or mouse from USB port, wait a few seconds, and reconnect it.4. Connect keyboard or mouse to another USB port on the user's computer.5. Make sure USB connectors are plugged in completely and correctly.6. Visually inspect USB connectors and ports for damage or debris.7. Try operating user's mouse on another surface. Ask user about type of surface usually being used with mouse. Glossy or transparent surfaces, or those with repetitive patterns, may cause mouse-tracking errors or faulty mouse operation. Explain that solid, non-reflective, opaque surfaces work best. Surface should be clean, but not shiny.8. Visually inspect user's keyboard or mouse for dirt, hair, liquid damage, or other debris. Check to see whether user has pets. Pet hair can lay across laser and cause intermittent mouse issues. Refer to article HT204172: Cleaning your Apple products for information on cleaning user's keyboard or mouse.9. For keyboard issues, refer to HT204540: If your wireless or USB keyboard doesn't work for troubleshooting tips.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's USB keyboard or mouse to a free USB port on a known-good computer to determine whether issue is related to USB port on user's computer, or to user's USB peripheral.	Yes	Go to "USB Port Not Recognized" troubleshooting flow.	`\${nodeText.yesSymptomCode}`	
	Does user's keyboard or mouse function when used with a known-good computer?	No	Go to step 2.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
2.	Visually inspect the user's USB mouse or keyboard to verify that attached USB cable and/or connector is not damaged or frayed.	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
	<p>Check user's keyboard or mouse for physical and/or liquid damage.</p> <p>On mice, verify that all mouse buttons click and laser tracking LED illuminates.</p> <p>On keyboards, verify that all keyboard buttons are present and can be depressed normally.</p> <p>Does the user's USB mouse or keyboard, or its attached cable or connector, show signs of damage?</p>	No	Go to step 13.	`\${nodeText.noSymptomCode}`	
3.	<p>Isolate damage issue to either user's wired USB keyboard or mouse.</p> <p>Which peripheral is damaged?</p>	USB Keyboard	Go to step 4.	`\${nodeText.yesSymptomCode}`	
		USB Mouse	Go to step 10.	`\${nodeText.noSymptomCode}`	
4.	<p>Closely examine user's keyboard to determine exact nature of the issue.</p> <p>Look for any signs of liquid spill, liquid penetration, or liquid damage to keyboard.</p> <p>Is damage to user's keyboard related to liquid spill?</p>	Yes	<p>Replace USB keyboard. Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K90	KEYBOARD
		No	Go to step 5.	`\${nodeText.noSymptomCode}`	
5.	<p>Click each key to ensure all keys are not sticking in the down or up position.</p> <p>Is damage to user's keyboard related to sticky keys or slow key response?</p>	Yes	<p>Replace USB keyboard. Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K05	KEYBOARD
		No	Go to step 6.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
6.	Look for any loose or missing keycaps. Is damage to user's keyboard related to loose or missing keycaps?	Yes	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K27	KEYBOARD
		No	Go to step 7.	\${nodeText.noSymptomCode}	
7.	Closely inspect the keyboard for any signs of physical damage that may affect operation. Does the user's keyboard exhibit this symptom?	Yes	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K16	KEYBOARD
		No	Go to step 8.	\${nodeText.noSymptomCode}	
8.	Closely examine the keyboard for signs of paint wearing off of one or more keys. Does the user's keyboard exhibit this symptom?	Yes	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K35	KEYBOARD
		No	Go to step 9.	\${nodeText.noSymptomCode}	
9.	Closely inspect the keyboard for any signs of cosmetic damage that does not affect operation. Does the user's keyboard exhibit this symptom?	Yes	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K21	KEYBOARD
		No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
10.	<p>Closely examine user's mouse to determine exact nature of the issue.</p> <p>Look for any signs of liquid spill, liquid penetration, or liquid damage to mouse.</p> <p>Is damage to user's mouse related to liquid spill?</p>	Yes	<p>Replace USB mouse. Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K90	MOUSE
		No	Go to step 11.	\${nodeText.noSymptomCode}	
11.	<p>Closely inspect the mouse for any signs of physical damage that may affect operation.</p> <p>Is there physical damage to user's mouse?</p>	Yes	<p>Replace USB mouse. Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K16	MOUSE
		No	Go to step 12.	\${nodeText.noSymptomCode}	
12.	<p>Closely inspect the mouse for any signs of cosmetic damage that does not affect operation.</p> <p>Is there cosmetic damage to user's mouse?</p>	Yes	<p>Replace USB mouse. Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K21	MOUSE
		No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	
13.	<p>Isolate failure issue to either user's wired USB keyboard or mouse.</p> <p>Which peripheral is malfunctioning?</p>	USB Keyboard	Go to step 18.	\${nodeText.yesSymptomCode}	
		USB Mouse	Go to step 14.	\${nodeText.noSymptomCode}	
14.	<p>Connect user's USB mouse to a free USB port on a known-good computer, and check System Information to determine whether the computer recognizes the mouse.</p> <p>Is mouse recognized by a known-good computer?</p>	Yes	Go to step 15.	\${nodeText.yesSymptomCode}	
		No	Replace USB mouse. Verify issue resolved.	K15	MOUSE

	Check	Result	Action	Code	Commodity
15.	Move the mouse and verify that the cursor on the known-good computer screen moves smoothly.	Yes	Replace USB mouse. Verify issue resolved.	K26	MOUSE
	Is issue related to mouse function?	No	Go to step 16.	\${nodeText.noSymptomCode}	
16.	Click and roll the mouse's scroll ball to check that it rolls freely in all directions, with no physical resistance.	Yes	Replace USB mouse. Verify issue resolved.	K06	MOUSE
	Is issue related to the scroll ball?	No	Go to step 17.	\${nodeText.noSymptomCode}	
17.	Click the mouse's various buttons to verify they click properly, without sticking, each time they are pressed.	Yes	Replace USB mouse. Verify issue resolved.	K14	MOUSE
	Is issue related to the mouse button(s)?	No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	
18.	Connect user's USB keyboard to a free USB port on a known-good computer, and check System Information to determine whether the computer recognizes the keyboard.	Yes	Go to step 19.	\${nodeText.yesSymptomCode}	
	Is keyboard recognized by a known-good computer?	No	Replace USB keyboard. Verify issue resolved.	K15	KEYBOARD
19.	Verify that each and every keyboard key functions as expected when pressed and released.	Yes	Replace USB keyboard. Verify issue resolved.	K01	KEYBOARD
	Is issue related to specific keys not working?	No	Go to step 20.	\${nodeText.noSymptomCode}	
20.	Verify that the keyboard language is as expected.	Yes	Replace USB keyboard. Verify issue resolved.	K04	KEYBOARD
	Is issue related to keyboard language?	No	Issue cannot be duplicated.	\${nodeText.noSymptomCode}	

Internal Microphone Issues

Unlikely causes:

Battery, camera, DisplayPort cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Microphone not working.• Microphone audio garbled.• Line audio input functions properly. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. On user's computer go to System Preferences > Sound and verify the following:<ul style="list-style-type: none">◦ Input tab:<ul style="list-style-type: none">▪ "Internal microphone" source is available and selected.▪ Input volume slider is not set to zero.◦ Output tab:<ul style="list-style-type: none">▪ Sound output device is set to Internal Speakers.▪ Output volume is not muted or set to zero.2. Go to System Preferences > Sound > Input tab, and verify that "Input level" indicator moves when speaking into microphone.3. Launch QuickTime Player. Choose New Audio Recording from File menu. Choose Built-in Microphone from right pop-up menu, and adjust input volume using slider in center of window.4. Check that no cables are inserted into audio input or output jacks. Use an otoscope to visually inspect both jacks. Use compressed air to clean and remove any debris.5. Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear the startup sound a second time.6. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Update or restore if needed. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with Power Supply Covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using restore partition or up-to-date, bootable OS X volume, and try to reproduce audio input issue using known-good audio sources and cables. Does issue persist with a known-good OS?	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
		No	Restore correct OS X build. See article HT204319: OS X versions and builds included with Mac computers . Verify resolution.	`\${nodeText.noSymptomCode}`	
2.	Connect a pair of headphones to audio-out port. Launch QuickTime Player and choose New Audio Recording from File menu. In the new recording window, choose Built-in Microphone from right pop-up menu. Adjust input volume using slider in center of window. Press red record button to start recording. Speak near microphone (top of display bezel, near camera) for several seconds, then click record button again to stop recording. Play recorded audio file using headphones to monitor quality of recording. If needed, press F11-F12 keys to adjust volume. Confirm that computer is able to record accurately from internal microphone input. Does computer accurately reproduce sound from internal microphone input?	Yes	Microphone appears to be performing to specification. Verify issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 3.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
3.	Connect an iPhone Headset with Microphone to the external headphone jack port.	Yes	Go to step 4.	\${nodeText.yesSymptomCode}	
	<p>Launch QuickTime Player and choose New Audio Recording from File menu. Choose Built-In Microphone: External Microphone from the right pop-up menu. Adjust input volume using slider in center of window.</p> <p>Press red record button to start recording. Speak near microphone for several seconds, then click record button again to stop recording.</p> <p>Play recorded audio file using headphones to monitor quality of recording. If needed, press F11-F12 keys to adjust volume, and confirm that computer is able to record accurately from its built-in line-in input.</p> <p>Does computer accurately reproduce sound from external line input?</p>	No	Audio input issue is not limited to microphone input. Go to “Audio-in Jack Issues” troubleshooting flow.	\${nodeText.noSymptomCode}	
4.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
	<p>Remove LCD panel with glass.</p> <p>Locate and disconnect camera/microphone/ALS cable from logic board and inspect cable for damage.</p> <p>Is cable damaged?</p>	No	Go to step 5.	\${nodeText.noSymptomCode}	
5.	Inspect camera/microphone/ALS cable connector port on logic board for damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Is logic board connector damaged?	No	Go to step 6.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
6.	Reconnect camera/microphone/ALS cable to logic board.	Yes	Issue resolved by reseating camera/microphone/ALS cable. Verify resolution.	\${nodeText.yesSymptomCode}	
	Retest recording.	No	Go to step 7.	\${nodeText.noSymptomCode}	
	Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.				
7.	Is recorded sound sample audible, clear, and free of distortion?	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
	To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required. Do you have immediate access to a known-good camera/microphone/ALS cable?	No	Replace camera/microphone/ALS cable. Verify issue resolved.	X19	INTERNAL CABLE
8.	Retest recording. Is recorded sound sample audible, clear, and free of distortion?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X19	INTERNAL CABLE
		No	ESCALATION REQUIRED. Microphone is part of rear housing. Replace rear housing. Verify issue resolved. Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty . Contact ACS for additional support regarding warranty coverage for this part. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

	Check	Result	Action	Code	Commodity
9.	Verify that internal microphone is available and selected. Record a sound sample using GarageBand or QuickTime Player to verify quality of audio during playback. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

No Audio from Internal Speaker(s) or Headphone Jack

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, fan, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, memory, power supply, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No sound from internal speaker(s).No sound from left and/or right speaker channel.No sound from headphone jack. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Adjust volume controls to verify setting is above minimum, and audio is not muted.Test with known-good stereo sound file.Connect headphones or external speakers to external audio port. Verify in System Preferences > Sound > Output that Audio Out setting switches to Headphones, and whether audio can be played on external speakers.Disconnect any device connected to external audio port. In System Preferences > Sound > Output, check that sound output device reverts to Internal Speakers. Use Balance slider to isolate left and right speakers and check whether issue is limited to one speaker.Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.Check for and apply the latest software and firmware updates.Start up the computer using a known-good, up-to-date, bootable OS X volume and retest. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using known-good, up-to-date, bootable OS X volume. Play the same known-good sound file and compare using internal speakers and known-good headphones or external speakers. Is sound now audible on both internal and external speakers?	Yes	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall correct OS X build. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 2.	\$(nodeText.noSymptomCode)	
2.	Play known-good audio file on internal speakers, then connect known-good headphones or external speakers and check for presence of sound on external speakers. Is sound issue limited to external headphones/speakers?	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
3.	Disconnect headphones or external speakers. Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding. Remove LCD panel with glass. Inspect Audio Cable Connector to Audio I/O ports and its corresponding connection on logic board. Reseat connection and retest. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. The power supply contains a high voltage capacitor that may remain charged for up to an hour after unplugging the computer. Is internal/external sound now audible on both speakers?	Yes	Issue resolved by reseating audio cable. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
4.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Issue resolved by reseating speaker cable connections. Verify resolution.	\${nodeText.yesSymptomCode}	
	Remove LCD panel with glass. Locate speaker connections on logic board. Inspect speaker cable connectors and corresponding connectors on logic board. Reseat connections and retest.	No	Go to step 5.	\${nodeText.noSymptomCode}	
	Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. The power supply contains a high voltage capacitor that may remain charged for up to an hour after unplugging the computer.				
	Is sound now audible on both speakers?				
5.	Disconnect headphones or external speakers. In System Preferences > Sound > Output, move Balance slider all the way left then all the way right, testing sound output each time.	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
	Does missing audio issue affect both internal speakers?	No	Go to step 8.	\${nodeText.noSymptomCode}	
6.	To troubleshoot this issue completely, known-good (left and right) internal speakers are required.	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
	Do you have immediate access to known-good speakers?	No	Replace logic board. Verify issue resolved.	M09	MLB
7.	Substitute known-good speakers and retest.	Yes	Replace both user's speakers. Verify issue resolved.	X08	OTHER ELECTRIC
	Is sound from known-good internal speakers audible?	No	Reinstall user's speakers. Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
8.	To troubleshoot this issue completely, known-good speakers are required. Do you have immediate access to a known-good speaker?	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	Replace speakers. Verify issue resolved.	X08	OTHER ELECTRIC
9.	Substitute known-good speakers and retest. Is sound now audible on both speakers?	Yes	Replace user's speakers. Verify issue resolved.	X08	OTHER ELECTRIC
		No	Replace logic board. Reinstall user's speakers. Verify issue resolved.	M09	MLB
10.	Connect and disconnect external speakers/headphones, verifying that audio can be played from both external and internal speakers and that computer produces a clear, distortion-free sound. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

No Audio to External Display Speakers

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Sound cannot be enabled on speakers of an external Thunderbolt display, Mini DisplayPort display, or a compatible HDMI display using a compatible HDMI adapter with audio support <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Verify that nothing is connected to the headphone/audio output port on the user's computer, which would prevent audio from routing to speakers. In System Preferences > Sound > Output, select "Internal Speakers" then play audio file to verify it can be played on computer.Verify user's computer is using a known-good, compatible Thunderbolt display, Mini DisplayPort display, or HDMI display equipped with internal speaker(s), using a compatible Thunderbolt-to-HDMI adapter with audio support.Refer to following articles for more information:<ul style="list-style-type: none">HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ)HT204149: Apple Mini DisplayPort adapters: Frequently asked questions (FAQ)If the user is connecting to another Mac in Target Display Mode, the sound from primary Mac should be playable on external display Mac's speakers. Refer to article PH19038: Use another Mac as a display for more information on how to do this.If the user is using an HDMI display such as an HDTV, sound from user's Mac should be playable on the HDTV's speakers. Refer to article PH19036: Use your TV as a display for more information on how to do this.In System Preferences > Displays, verify that external display is detected and enabled.In System Preferences > Sound > Output, select the available Thunderbolt, DisplayPort, or HDMI Output device type, depending on display model and connection.In System Preferences > Sound > Output, adjust output volume and balance levels.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Test audio output using more than one application or website.Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.With display connected to computer, check for and apply the latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Connect a known-good display, display cable, and adapter (if needed) to a known-good similar-generation computer. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play with known-good computer?</p>	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
2.	<p>Connect known-good display, display cable, and adapter (if present) to user's computer. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play with user's computer?</p>	Yes	Go to step 4.	\$(nodeText.yesSymptomCode)	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
3.	<p>Start up user's computer using recovery partition or an up-to-date, bootable OS X volume. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play when user's computer has a known-good OS?</p>	Yes	<p>Reinstall OS X on user's computer. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Check for and apply latest software and firmware updates. Verify resolution.</p>	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
4.	Retest user's display, cable, and/or adapter one at a time to identify affected element. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source. Can external display audio be enabled and play with user's computer?	Yes	Issue resolved. Verify issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 5.	`\${nodeText.noSymptomCode}`	
5.	User's external display, cable and/or adapter appears to be causing the issue. What is the product brand?	Apple display, cable, or adapter	Go to step 6.	`\${nodeText.yesSymptomCode}`	
		Third-party display, cable, or adapter	Refer user to contact product manufacturer for further compatibility, software requirements information, or service.	`\${nodeText.noSymptomCode}`	
6.	Issue appears to be related to an Apple product. Specify the product type. What type of Apple product?	Apple display	Return computer to user. Enter Apple display serial number into GSX, locate its service guide, and troubleshoot display using a known-good computer.	`\${nodeText.yesSymptomCode}`	
		Apple cable or adapter	Check for possible accidental damage. Replace Apple cable or adapter. Verify issue resolved.	X03	EXTERNAL CABLE
7.	Play a known-good audio file/source and verify that sound output to all speakers is audible. Is the issue resolved?	Yes	Issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Thunderbolt Cable Connectivity Issues

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Unable to access Thunderbolt peripherals.• Thunderbolt shows no connection.• Slow Thunderbolt performance. <p>Note: These symptoms address issues with the Thunderbolt cable, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the "Troubleshoot another issue" button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check manufacturer's minimum system requirements for connectivity to user's Thunderbolt peripheral. Refer to article HT201164: About Thunderbolt to Thunderbolt cable (2.0 m).2. Check Thunderbolt presence in System Information. Complete following steps:<ul style="list-style-type: none">◦ Connect user's Thunderbolt cable to available Thunderbolt port on user's computer or known-good computer supporting Thunderbolt.◦ Connect opposite end of user's Thunderbolt cable to known-good Thunderbolt peripheral, such as:<ul style="list-style-type: none">▪ Known-good computer supporting Thunderbolt target disk mode▪ Apple Thunderbolt Display▪ Other known-good Thunderbolt peripheral◦ Power on connected equipment and start up user's computer.◦ Launch System Information. Verify computer's Thunderbolt port and cable connection status appear in System Information > Hardware > Thunderbolt. Link status should be: 2 (connected), not 7 (not connected).3. Reverse Thunderbolt cable. Connect other end of cable to user's computer. Repeat step 2 above to check for Thunderbolt presence.4. Disconnect user's Thunderbolt cable and reconnect to another available Thunderbolt port on user's computer (if available). Repeat step 2 to check for Thunderbolt presence.5. Substitute known-good Thunderbolt to Thunderbolt cable (2.0 m). Repeat step 2 to check for Thunderbolt presence.6. Shut down user's computer, wait a few seconds, then restart it. Repeat step 2 to check for Thunderbolt presence.7. Refer to article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.8. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. Repeat step 2 to check for Thunderbolt presence.9. Check for and apply the latest software and firmware updates. Repeat step 2 to check for Thunderbolt presence.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Inspect both Thunderbolt cable connectors for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.</p> <p>Closely inspect cable for signs of damage, excessive wear, kinks, breaks, bends, knots, being wound too tight, etc.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 2.	\${nodeText.yesSymptomCode}	
		No	Go to step 3.	\${nodeText.noSymptomCode}	
2.	<p>Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p> <p>Refer to article OP18: SERVICE: Flat Rate and Accidental Damage Repair Pricing for Mail-In Mac Products.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Issue resolved. Return computer to user using correct positioning.	\${nodeText.noSymptomCode}	
3.	<p>Inspect user's Thunderbolt cable connectors connectors, and cable itself, for signs of excessive and/or unusual heat dissipation during operation.</p> <p>Perform this check only after cable has been connected to a powered computer port for at least two minutes.</p> <p>Did you find any signs of excessive heat in any part of the Thunderbolt cable or connector ends?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
4.	<p>Verify connected Thunderbolt peripheral is recognized by computer when connected by user's Thunderbolt cable.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Thunderbolt FireWire Adapter Connectivity Issues

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No FireWire port present.Unable to access FireWire resources.FireWire shows no connection.Slow FireWire performance. <p>Note: These symptoms address issues with the Thunderbolt FireWire Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on "Troubleshoot another issue" button to select a functional area and issue that addresses issue with computer's Thunderbolt port instead.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Open System Information. Verify computer's FireWire port presence in System Information > Hardware > FireWire. Verify Thunderbolt FireWire Adapter presence in System Information > Hardware > Thunderbolt.Try known-good Thunderbolt FireWire Adapter, FireWire hardware and cable with user's computer.Using known-good Thunderbolt FireWire Adapter, FireWire hardware and cable, start up computer using OS X Recovery or an up-to-date, bootable OS X volume. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery. Repeat step 1 above to check for Thunderbolt and FireWire presence.Verify bus-powered FireWire devices are receiving adequate power from computer. Refer to article HT201338: Apple Thunderbolt Adapters: Frequently asked questions (FAQ).Check manufacturer's minimum system requirements for device. Refer to article PH19097: If a FireWire device isn't working.Refer to article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Check for and apply the latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Thunderbolt FireWire Adapter connectors, cable, and body for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris. Did you find any damaged components?	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
2.	Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	Refer to article OP18: SERVICE: Flat Rate and Accidental Damage Repair Pricing for Mail-In Mac Products . Does user want to proceed with out-of-warranty repair?	No	Issue resolved. Return computer to user using correct positioning.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
3.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.</p> <p>Verify FireWire port presence in System Information > Hardware > FireWire.</p> <p>Verify Thunderbolt FireWire Adapter presence in System Information > Hardware > Thunderbolt.</p> <p>Does user's Thunderbolt FireWire Adapter appear in both areas of System Information?</p>	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
		No	Go to step 4.	\${nodeText.noSymptomCode}	
4.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
		No	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
5.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Repeat System Information presence checks from previous steps using user's computer.</p> <p>Does known-good Thunderbolt FireWire Adapter now appear in both areas of System Information?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
6.	<p>To continue troubleshooting this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • FireWire 400/800 device, for example, hard drive or camera • FireWire 800 cable, or FireWire 800-to-400 adapter with FireWire cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
7.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect adapter's FireWire port to a known-good, bus-powered FireWire device with a known-good FireWire cable or adapter/cable combination.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination mount to desktop or appropriate application?</p>	Yes	Go to step 10.	\${nodeText.yesSymptomCode}	
		No	Go to step 8.	\${nodeText.noSymptomCode}	
8.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	<p>Replace Thunderbolt FireWire Adapter. Verify issue resolved.</p>	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
9.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Using same computer, cable, and external FireWire device, start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination now mount to desktop or appropriate application?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
10.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect user's FireWire cable or adapter/cable combination to known-good FireWire device and user's Thunderbolt FireWire Adapter.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device.</p> <p>Does known-good FireWire device mount to desktop with user's cable?</p>	Yes	Go to step 11.	\${nodeText.yesSymptomCode}	
		No	Advise user to replace their FireWire adapter and/or FireWire cable set.	\${nodeText.noSymptomCode}	
11.	<p>Connect user's FireWire device and cable or adapter/cable combination.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does user's FireWire device/cable combination mount to desktop or appropriate application?</p>	Yes	Issue resolved. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	Review article PH19097: If a FireWire device isn't working with user . Check manufacturer's minimum system requirements for device. Verify issue resolved.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
12.	Verify connected FireWire device is recognized by computer. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Thunderbolt Port Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer does not recognize Thunderbolt devices. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check for and apply the latest software and firmware updates. Check article HT204319: OS X versions and builds included with Mac computers to make sure the system build is correct for this computer model. The correct build includes Thunderbolt drivers that match the Thunderbolt controller on the logic board.Check System Information > Hardware > Thunderbolt to verify that Thunderbolt hardware is recognized.Try using a known-good Thunderbolt cable. See article HT201164: About Thunderbolt to Thunderbolt cable (2.0 m).Try using a known-good Thunderbolt device or a Thunderbolt-capable computer in target disk mode. Refer to PH19021: Transfer files between two computers using target disk mode.Refer to article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ).Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Reset SMC using the procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC). <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. The correct build includes Thunderbolt drivers that match the Thunderbolt controller on the logic board.</p> <p>Is the proper OS X build installed?</p>	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall correct OS X build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.	\$(nodeText.noSymptomCode)	
2.	<p>Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac with unique user ID (UID) and firmware version shown.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
3.	<p>Connect a known-good Thunderbolt device using a known-good Thunderbolt cable. Refresh System Information > Hardware > Thunderbolt. Thunderbolt port status should update, then show connected Thunderbolt device.</p> <p>Does System Information list connected Thunderbolt device?</p>	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Go to step 5.	\$(nodeText.noSymptomCode)	
4.	<p>Reset PRAM by holding down Command-Option-P-R keys while booting, until you hear startup sound for the second time.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Go to step 5.	\$(nodeText.noSymptomCode)	
5.	<p>To troubleshoot this issue completely, a known-good logic board is required.</p> <p>Do you have immediate access to a known-good logic board?</p>	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M33	MLB

	Check	Result	Action	Code	Commodity
6.	<p>Substitute a known-good logic board and retest. Reset PRAM again and restart to desktop. Check System Information to verify Thunderbolt hardware.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Replace logic board. Verify issue resolved.	M33	MLB
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
7.	<p>Connect Thunderbolt cable from known-good Thunderbolt device to second Thunderbolt port. Wait for known good Thunderbolt device to mount. Refresh System Information > Hardware > Thunderbolt. Thunderbolt port status should update, then show connected Thunderbolt device.</p> <p>Does System Information list connected Thunderbolt device on second Thunderbolt port?</p>	Yes	Issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Replace logic board. Verify issue resolved.	M33	MLB
8.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID, most recent firmware version, and correct link status.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

USB Port Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Standard USB devices not recognized or not powered. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Disconnect all USB devices.Verify that user's USB device is compatible with computer. Refer to HT201163: Using USB 3 devices on Mac computers FAQ for more information about compatibility with various USB devices.Check to see whether user's USB device requires a specific driver to function properly.Check for and apply latest software and firmware updates.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Check System Information > USB device tree to see whether computer recognizes internal USB devices (Bluetooth, IR, camera).Test each USB port using a known-good Apple wired keyboard or mouse.Verify that USB hubs being used have sufficient power.Start up using up-to-date, bootable OS X volume; then check System Information > USB device tree to see whether computer recognizes internal USB devices.Refer to article HT204319: OS X versions and builds included with Mac computers and verify that the correct version and build of OS X is installed.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect all USB devices. Verify whether known-good Apple wired keyboard or mouse functions correctly and is recognized in System Information > USB device tree. Is known-good Apple USB device functional and recognized?	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	Go to step 2.	\$(nodeText.noSymptomCode)	
2.	Continue to use known-good Apple wired keyboard or mouse. Start up computer using known-good, up-to-date, bootable OS X volume. Verify whether known-good USB device functions correctly and is recognized in System Information > USB device tree. Is a known-good Apple USB device functional and recognized?	Yes	Go to step 4.	\$(nodeText.yesSymptomCode)	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
3.	Inspect USB ports for lint, debris, or other foreign material. Remove debris with an anti-static brush. Is known-good Apple USB device functional and recognized?	Yes	Issue resolved. Return computer to user, explaining that debris in USB port caused issue and what to do to prevent contamination in the future.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M15	MLB
4.	Use Disk Utility to repair the file directory on internal hard drive. Restart and verify whether a known-good USB device functions correctly and is recognized in System Information > USB device tree. Is known-good Apple USB device functional and recognized?	Yes	Issue resolved by directory repair in Disk Utility. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Refer to article HT204319: OS X versions and builds included with Mac computers and restore USB drivers by reinstalling correct system build of OS X. Verify issue resolved.	\$(nodeText.noSymptomCode)	
5.	This computer can support one high-powered USB device (e.g., iPad, iPhone, USB hard drive) at a time. Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 900 mA. See article HT204377: Apple Computers and Displays: Powering peripherals through USB for more information. Do you have immediate access to a known-good, high-powered USB device that draws over 900 mA?	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Go to step 8.	\$(nodeText.noSymptomCode)	
6.	Connect known-good, high-powered USB device to one of the computer's USB ports. In System Information > USB device tree, "Current Available (mA)" and "Extra Operating Current (mA)" should each report 900 mA. Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 900 mA. Verify that known-good USB device functions as expected. Does "Extra Operating Current" appear in System Information?	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M38	MLB

	Check	Result	Action	Code	Commodity
7.	Connect exact same high-powered USB device to next USB port. Make sure nothing is plugged into other port(s). Both "Current Available (mA)" and "Extra Operating Current (mA)" should each report 900 mA in System Information. Repeat action with every available USB port. Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 900 mA. Verify USB device operates as expected. Does "Extra Operating Current" appear in System Information?	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	Replace logic board. Verify issue resolved.	M38	MLB
8.	Try user's USB device with a known-good computer. Verify whether it functions normally and is recognized in System Information > USB device tree. Is user's USB device functional and recognized?	Yes	Issue resolved by testing USB ports and verifying user's USB device. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	Advise user to do the following: <ul style="list-style-type: none"> • Contact USB device manufacturer for support. • Verify system requirements and Mac compatibility. • Find out whether device requires additional software. 	\${nodeText.noSymptomCode}	
9.	<ul style="list-style-type: none"> • Confirm that a known-good USB device is functional and recognized. • Check System Information for correct power allocation to USB device. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

External USB ODD Noisy

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<p>Note: Be sure you understand what type of optical drive noise you should be concerned about and what noises you can safely ignore. The following lists help distinguish normal, functional optical drive sounds from noises that may indicate drive malfunction.</p> <p>Typical noises include sounds made during the following activities:</p> <ul style="list-style-type: none">• Waking computer from sleep• Burning a CD or DVD• Inserting a disc• Ejecting a disc• Importing (“ripping”) an audio CD in iTunes• Playing a DVD• Accessing an idle disc <p>Abnormal noises include the following:</p> <ul style="list-style-type: none">• Grinding• Loud, repeated clicking• Scraping sounds• Constantly seeking or cycling the eject mechanism with no disc inserted <p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none">• Noise during start up• Noise during operation• Noise when drive is copying or saving data <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify user's issue involves only abnormal sounds, as defined in symptoms.2. Verify Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.3. Verify that there is not an additional label adhered to the disc which could cause the disc to lose balance and create excessive noise when rotating at high speed.4. Verify that the optical drive is actually an Apple USB SuperDrive, which has a longer USB cable (340mm), and not a MacBook Air SuperDrive, which has a slightly shorter cable (250mm) that may not reach iMac's USB ports while sitting on a flat surface alongside iMac.5. Compare optical drive noise to a known-good equivalent Apple USB SuperDrive. Use sound samples in article HT201623: Mac notebooks with optical drives: Noises from the optical drive to compare.6. Verify noise issue does not involve waking computer. When starting up or waking from sleep, Apple USB SuperDrive may make unfamiliar noises. Refer to article HT201623: Mac notebooks with optical drives: Noises from the optical drive.7. Test user's optical disc in a known-good drive to rule out a media issue. Verify disc size and shape are within specification in article HT201788: Get help with the slot-loading SuperDrive on your Mac computer.8. Test Apple USB SuperDrive with known-good discs. Verify media is free to spin without scraping edge or surface of media.9. Verify noise during seek activity is excessive. Seek noise should subside once disc is mounted.10. Verify disc spin noise is excessive. Disc spin should cease 30 seconds after mounting disc in Finder.11. Inspect Apple USB SuperDrive drive slot for obstructions such as debris or a stuck disc.12. Inspect Apple USB SuperDrive USB cable and USB connector for damage.13. Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012 and later), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.14. Apple USB SuperDrive must be plugged directly into computer's USB port, and cannot be used while connected to a USB hub.15. Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.16. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting up computer with Apple USB SuperDrive already plugged in.17. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Check whether Apple USB SuperDrive is constantly seeking or cycling eject mechanism with no optical disc inserted. Optical drive should perform only one reset sequence and then rest idly, ready for media.</p> <p>Does optical drive spin, seek, and/or reset continuously without an optical disc inserted?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
		No	Go to step 2.	\${nodeText.noSymptomCode}	
2.	<p>Closely inspect user's Apple USB SuperDrive to determine whether a disc or other debris is stuck inside.</p> <p>Is a disc or other debris stuck in drive?</p>	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	Go to step 4.	\${nodeText.noSymptomCode}	
3.	<p>Refer to article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials.</p> <p>Retest Apple USB SuperDrive by inserting, mounting, and ejecting a known-good optical disc.</p> <p>Is optical drive function fully restored?</p>	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
4.	<p>Insert known-good optical disc, then eject disc. Listen carefully to Apple USB SuperDrive disc handling. Eject noise should consist of a pop as disc is released from motor hub, then gear movement as motor pushes disc out of slot. Repeat test several times.</p> <p>Is disc eject noise abnormal and excessive over multiple trials?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
		No	Go to step 5.	\${nodeText.noSymptomCode}	
5.	<p>Disconnect Apple USB SuperDrive and retest for computer noise.</p> <p>Has noise been eliminated?</p>	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
		No	Go to "Noise/Hum/Vibration" troubleshooting flow.	\${nodeText.noSymptomCode}	
6.	<p>To troubleshoot this issue completely, you will need an identical, known-good Apple USB SuperDrive with which to compare optical drive sounds.</p> <p>Do you have immediate access to a known-good Apple USB SuperDrive?</p>	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL

	Check	Result	Action	Code	Commodity
7.	Substitute a known-good Apple USB SuperDrive and retest.	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
	Has noise been eliminated?	No	Go to "Noise/Hum/Vibration" troubleshooting flow.	\${nodeText.noSymptomCode}	
8.	Verify Apple USB SuperDrive does not make any abnormal noises. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

External USB ODD Not Recognized

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Discs cannot be inserted.• Discs can be inserted, but are ejected immediately.• Discs can be inserted, but are ejected after drive has spun up for a few seconds.• Discs can be inserted and ejected, but do not appear in Finder. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Go to Finder Preferences > General and make sure “CDs, DVDs, and iPods” is checked under “Show these items on the desktop.”2. Make sure Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.3. Verify that optical drive is an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside the iMac.4. Inspect Apple USB SuperDrive drive slot for obstructions, such as a stuck disc.5. Inspect Apple USB SuperDrive cable and USB connector for damage.6. The Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012 and later), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.7. Apple USB SuperDrive must be plugged directly into computer's USB port and cannot be used while connected to a USB hub.8. Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.9. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.10. Refer to article HT201788: Get help with the slot-loading SuperDrive on your Mac computer.11. Connect Apple USB SuperDrive to known-good iMac, MacBook Pro (Retina, Mid 2012 or later), MacBook Air, or Mac mini (Early 2009 or later) to verify drive's functionality separately from user's computer.12. Disconnect user's Apple USB SuperDrive and connect a known-good Apple USB SuperDrive to same USB port on user's computer to verify computer's functionality separately from user's drive. If issue persists, troubleshoot as a faulty USB port on user's computer.13. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Connect user's Apple USB SuperDrive to an available USB port on user's computer and start up computer. Check System Information > Hardware > USB to verify presence of optical drive.</p> <p>Repeat this process using each USB port on user's computer to verify all of computer's USB ports are functioning.</p> <p>Does drive appear in System Information when connected to every USB port?</p>	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Go to "USB Port Not Recognized" troubleshooting flow.	\$(nodeText.noSymptomCode)	
2.	<p>Attempt to insert a known-good, properly formatted CD or DVD disc into Apple USB SuperDrive. Check whether disc auto-ejects either immediately or within a few seconds after drive has spun up.</p> <p>Does disc auto-eject shortly after insertion?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
3.	<p>After insertion, verify disc spins and disc volume mounts in Finder.</p> <p>Does drive mount known-good disc?</p>	Yes	Go to step 4.	\$(nodeText.yesSymptomCode)	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J09	OPTICAL
4.	<p>Check to see whether Apple USB SuperDrive properly mounts then reads both known-good CD and DVD media.</p> <p>If only one type of media is recognized, there may be a laser issue.</p> <p>Can drive read both media types?</p>	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	Go to "External USB ODD Read/Write or Performance Issues" troubleshooting flow.	\$(nodeText.noSymptomCode)	
5.	<p>Insert, mount, and eject both a known-good CD and a known-good DVD.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	J99	

External USB ODD Read/Write or Performance Issues

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Errors when writing to optical mediaErrors when reading from optical mediaHangs when accessing or writing dataRead or write speeds slower than expected <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Test user's optical media in known-good Apple USB SuperDrive connected to known-good computer.Test known-good, compatible optical media in user's Apple USB SuperDrive connected to a known-good computer.Go to System Information > Hardware > Disc Burning to compare actual disc burning specifications to user's expectations.See articles HT2543: About optical disc drive burning and write speeds and HT2882: Factors that affect writing to or reading from optical media to learn more about disc burning and how performance is affected by write speeds, media types, and software.Make sure Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.Verify that the optical drive is actually an Apple USB SuperDrive, which has a longer USB cable (340mm), and not a MacBook Air SuperDrive, which has a slightly shorter cable (250mm) that may not reach iMac's USB ports while sitting on a flat surface alongside iMacInspect Apple USB SuperDrive slot for obstructions such as debris or a stuck disc.Inspect Apple USB SuperDrive USB cable and USB connector for damage.The Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012 and later), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper drive operation. Verify user's configuration is supported.The Apple USB SuperDrive must be directly plugged into computer's USB port and cannot be used while connected to a USB hub.With Apple USB SuperDrive connected to user's computer, restart computer while pressing mouse button or Eject key to cycle optical drive.If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.Refer to article HT201788: Get help with the slot-loading SuperDrive on your Mac computer.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's Apple USB SuperDrive to user's computer and start up computer. Insert media into Apple USB SuperDrive and listen for scraping or scratching noises as disc spins up. Eject disc and examine surface and edges for scrapes or scratches. Verify disc spins freely without optical drive scraping edge or surface. Does media spin freely in drive?	Yes	Go to step 2.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
2.	Closely inspect user's Apple USB SuperDrive to determine whether disc or debris is stuck inside. Is disc or debris stuck in drive?	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	Go to step 4.	\${nodeText.noSymptomCode}	
3.	Refer to article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials. Retest Apple USB SuperDrive by inserting, mounting and ejecting a known-good optical disc. Is optical drive function fully restored?	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
4.	Verify optical drive can properly read known-good CDs. Can optical drive read CDs?	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
		No	Go to step 6.	\${nodeText.noSymptomCode}	
5.	Verify optical drive can properly read known-good DVDs. Can optical drive read DVDs?	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Go to step 6.	\${nodeText.noSymptomCode}	
6.	Check System Information > Hardware > USB to verify presence of optical drive. Does optical drive appear in System Information?	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Go to "External USB ODD Not Recognized" troubleshooting flow.	\${nodeText.noSymptomCode}	
7.	Burn test data to CD and DVD media compatible with Apple USB SuperDrive. Verify burned media is recognized and readable by drive. Can optical drive read its own burned media?	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J03	OPTICAL

	Check	Result	Action	Code	Commodity
8.	To troubleshoot this issue completely, you will need an identical, known-good Apple USB SuperDrive with which to compare optical disc read and burn times. Do you have immediate access to a known-good Apple USB SuperDrive?	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J07	OPTICAL
9.	Check read and burn times of user's Apple USB SuperDrive connected to a known-good computer. Using same media type and brand, compare these times against a known-good Apple USB SuperDrive connected to same computer. Does user's drive have significantly longer read or burn times than known-good drive?	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J07	OPTICAL
		No	Issue resolved.	\${nodeText.noSymptomCode}	
10.	Test all Apple USB SuperDrive functions and drive performance to verify a successful repair. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	J99	

External USB ODD Rejects, Does Not Accept, or Does Not Eject Media

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Cannot insert a disc into drive.• Cannot eject a disc from drive.• Drive ejects discs immediately after insertion. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify Apple USB SuperDrive is on flat surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.2. Verify that optical drive is actually an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside the computer.3. Inspect optical drive slot for obstructions (stuck disc, for example).4. Inspect Apple USB SuperDrive USB cable and connector for damage.5. Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012 or later), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.6. Apple USB SuperDrive must be directly plugged into computer's USB port, and cannot be used while connected to a USB hub.7. Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.8. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.9. Refer to article HT201788: Get help with the slot-loading SuperDrive on your Mac computer.10. Connect user's Apple USB SuperDrive to a known-good computer and attempt to use it, to verify drive's functionality separately from user's computer.11. Connect a known-good Apple USB SuperDrive to user's computer. Attempt to use drive to verify computer's functionality separately from user's Apple USB SuperDrive.12. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's Apple USB SuperDrive to an available USB port on user's computer and start up computer. Check System Information > Hardware > USB to verify presence of optical drive.	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
	Does optical drive appear in System Information?	No	Go to "External USB ODD Not Recognized" troubleshooting flow.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
2.	<p>Closely inspect user's Apple USB SuperDrive to determine whether a disc or other debris is stuck inside.</p> <p>Is a disc or other debris stuck in drive?</p>	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
3.	<p>Refer to article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials.</p> <p>Retest Apple USB SuperDrive by inserting, mounting, and ejecting a known-good optical disc.</p> <p>Is optical drive function fully restored?</p>	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J02	OPTICAL
4.	<p>Verify known-good disc can fit through enclosure slot.</p> <p>Is clearance in enclosure slot sufficient for disc insertion?</p>	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Go to step 5.	\$(nodeText.noSymptomCode)	
5.	<p>Closely inspect entire Apple USB SuperDrive enclosure for dents, scratches, or other indications of impact or abuse.</p> <p>Is insufficient clearance due to accidental damage?</p>	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
6.	<p>Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
		No	Issue resolved. Using proper positioning, return computer to user.	\$(nodeText.noSymptomCode)	
7.	<p>Inspect slot on optical drive assembly for proper disc clearance.</p> <p>Is clearance in optical drive slot sufficient for disc insertion?</p>	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	Go to step 8.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
8.	When a CD or DVD pops off spindle inside an optical drive (usually due to impact to drive) and remains in drive mechanism, the loose disc prevents slot from opening fully, creating a closed condition. Inspect slot in optical drive to determine whether it is closed or not accepting discs.	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
	<p>If disc slot is closed, inspect drive mechanism, especially drive enclosure, for evidence of drop damage.</p> <p>Note: If disc slot is closed, but there is no sign of accidental damage, choose “No” to the question below.</p> <p>Is disc slot access closed due to accidental damage?</p>	No	Go to step 9.	\${nodeText.noSymptomCode}	
9.	Inspect slot in Apple USB SuperDrive to determine if it is closed or not accepting discs because of a stuck disc.	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
	Is disc slot access closed because of a stuck disc?	No	Go to step 10.	\${nodeText.noSymptomCode}	
10.	Make sure optical drive assembly is mounted into enclosure correctly and is properly aligned with enclosure slot opening.	Yes	Go to step 12.	\${nodeText.yesSymptomCode}	
	Is drive assembly properly aligned with enclosure slot opening?	No	Go to step 11.	\${nodeText.noSymptomCode}	
11.	Align optical drive assembly with enclosure's bezel slot.	Yes	Issue resolved. Apple USB SuperDrive alignment realigned disc inject function. Verify issue resolved.	\${nodeText.yesSymptomCode}	
	<p>Refer to article RP451: Apple USB SuperDrive to open drive enclosure.</p> <p>Retest Apple USB SuperDrive by inserting, mounting, and ejecting a known-good optical disc.</p> <p>Is optical drive function fully restored?</p>		Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
12.	Attempt to insert a known-good, properly formatted CD or DVD into Apple USB SuperDrive. Check whether disc auto-ejects either immediately or within a few seconds after drive has spun up.	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
	Does disc immediately auto-eject?	No	Go to step 13.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
13.	After insertion, check if disc spins and disc volume mounts in Finder. Does disc volume mount?	Yes	Go to step 14.	\${nodeText.yesSymptomCode}	
		No	Go to “External USB ODD Read/Write or Performance Issues” troubleshooting flow.	\${nodeText.noSymptomCode}	
14.	Eject disc by dragging disc icon to Trash or selecting disc icon and pressing Eject key or Command-E on keyboard. Does disc eject properly?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J02	OPTICAL
15.	Insert, mount, and eject a known-good optical disc. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	J99	

HDD Noisy

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, WiFi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<p>Note: Be sure you understand what type of hard drive noise you should be concerned about, and what noises you can safely ignore. The following descriptions help distinguish normal, functional hard drive sounds from noises that may indicate drive malfunction.</p> <p>Noises such as occasional quiet chirping or beeping are typically normal hard drive sounds.</p> <p>Refer to article TS3204: iMac: Evaluating System noises to determine whether noise is within expected range.</p> <p>Abnormal noises such as grinding or loud, repeated clicking or scraping sounds may be indications of a more serious issue.</p> <p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none">Noise during start upNoise during operationNoise when drive copies or saves data <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Important: Always ask whether user's data has been backed up prior to repair.</p> <ol style="list-style-type: none">Verify that user's issue involves only abnormal sounds, as defined in symptoms.Compare hard drive noise to a known-good equivalent computer. Refer to article TS3204: iMac: Evaluating System noises to determine if noise is within expected range.Check for and apply latest software and firmware updates.If the computer model is internally equipped with both a hard disk drive (HDD) and a solid-state drive (SSD), refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Use OS X Recovery to troubleshoot potential software issues and to verify hard drive presence. Hold down Command-R during startup to restart from recovery partition. Launch Disk Utility.	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
	See article HT201314: OS X: About OS X Recovery for more information.	No	Go to "HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read/Write Issues" troubleshooting flow.	`\${nodeText.noSymptomCode}`	
	Does hard drive appear in Disk Utility?				

	Check	Result	Action	Code	Commodity
2.	Verify that hard drive SMART status in Disk Utility shows as Verified.	Yes	Go to step 3.	`\${nodeText.yesSymptomCode}`	
	Is SMART status Verified?	No	Go to “HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read/Write Issues” troubleshooting flow.	`\${nodeText.noSymptomCode}`	
3.	Use Disk Utility to repair hard disk directory.	Yes	Go to step 5.	`\${nodeText.yesSymptomCode}`	
	Did Disk Utility repair directory or finish without error?	No	Go to step 4.	`\${nodeText.noSymptomCode}`	
4.	Consult article HT204319: OS X versions and builds included with Mac computers to determine correct version and build of OS X for this iMac; then erase and reinstall.	Yes	Go to step 5.	`\${nodeText.yesSymptomCode}`	
	Important: Always ask whether user’s data has been backed up prior to repair. Did installation successfully finish, and did computer start up to the desktop?	No	Go to “HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read/Write Issues” troubleshooting flow.	`\${nodeText.noSymptomCode}`	
5.	Restart computer and listen closely for abnormal noise.	Yes	Issue resolved.	`\${nodeText.yesSymptomCode}`	
	Has abnormal noise been eliminated?	No	Go to step 6.	`\${nodeText.noSymptomCode}`	
6.	Disconnect internal hard drive and start up from a known-good, up-to-date, bootable OS X volume.	Yes	Go to step 7.	`\${nodeText.yesSymptomCode}`	
	Has noise been eliminated?	No	Go to “Noise/Hum/Vibration” troubleshooting flow.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
7.	<p>To confirm that drive is mounted properly, remove hard drive and verify the following:</p> <ul style="list-style-type: none"> • Rubber vibration isolation bumper is properly installed around hard drive, and does not appear worn, cracked, out-of-position, or otherwise damaged. • Hard drive bracket is securely positioned over hard drive, is fastened to rear enclosure with appropriate screws, and does not appear loose, bent, or otherwise damaged. • Any other internal components that were loosened during take-apart process have been retightened. For example, power supply or speaker screws may need to be loosened to gain access to hard drive bracket. After this is done, these components must be retightened to ensure they do not cause noise due to loose components vibrating against other parts, or against enclosure, especially around the chin area. <p>Are hard drive mounting components undamaged and installed properly?</p>	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	<p>Replace missing or damaged components:</p> <ul style="list-style-type: none"> • Hard drive bracket • Rubber vibration isolation bumper 	X13	PIECE PART
8.	<p>To troubleshoot this issue completely, a known-good hard drive is required.</p> <p>Do you have immediate access to a known-good hard drive?</p>	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	Replace hard drive. Verify issue resolved.	H06	HDD

	Check	Result	Action	Code	Commodity
9.	Substitute a known-good hard drive and retest. Has noise been eliminated?	Yes	Replace hard drive. Verify issue resolved.	H06	HDD
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	H99	
10.	Confirm that computer no longer makes any abnormal noises. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	H99	

HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read/Write Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Boots to gray screenBoots to blue screenDisplays flashing folder with question mark or prohibitive symbolCannot save documentsDisplays read/write error message(s)Hangs when accessing or saving dataDrive or volume is not recognized in OS X El Capitan Disk Utility (icon is grayed out), after a failed data migration to a Mac with Fusion Drive or solid-state drive (SSD) / flash storage.Cannot erase volume, and bootable drive is not shown in Disk Utility. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Important: Always ask whether user's data has been backed up prior to repair.</p> <ol style="list-style-type: none">Disconnect all peripherals and attempt to start up computer.To restore default startup disk, reset PRAM by holding down Command-Option-P-R keys while starting up, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).If the computer is internally equipped with both a hard disk drive (HDD) and a solid-state drive (SSD) / flash storage, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and Later): About Fusion Drive for specific troubleshooting and restore processes. <p>Important: Using Disk Utility in OS X El Capitan to erase or partition a Fusion Drive or SSD might leave the drive without a usable partition. If this occurs, follow the steps in HT205401: Use Terminal to recover an unusable Fusion Drive or SSD disk partition and reinstall OS X El Capitan to resolve the issue.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Start up from known-good original system media or up-to-date, bootable OS X volume.</p> <p>Confirm that computer completes the startup process: chime > gray screen > Apple logo > spinning gear > login screen > desktop or installer screen.</p> <p>Does computer complete the startup process?</p>	Yes	Go to step 2.	\$_{nodeText.yesSymptomCode}	
		No	Go to “Will Not Start Up” troubleshooting flow.	\$_{nodeText.noSymptomCode}	
2.	<p>Run AST Storage Diagnostic on the user's computer and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	
		No	Go to step 3.	\$_{nodeText.noSymptomCode}	
3.	<p>Examine Storage Diagnostic results for presence of an internal drive.</p> <p>Did drive presence test PASS or FAIL?</p>	Pass	Go to step 4.	\$_{nodeText.yesSymptomCode}	
		Fail	Go to step 16.	\$_{nodeText.noSymptomCode}	
4.	<p>Examine Storage Diagnostic results for SMART status.</p> <p>Did SMART test PASS or FAIL?</p>	Pass	Go to step 5.	\$_{nodeText.yesSymptomCode}	
		Fail	Go to step 9.	\$_{nodeText.noSymptomCode}	
5.	<p>Examine Storage Diagnostic results for Short Random Multi-Block Read Test.</p> <p>Did Short Random Multi-Block Read Test PASS or FAIL?</p>	Pass	Go to step 6.	\$_{nodeText.yesSymptomCode}	
		Fail	Go to step 16.	\$_{nodeText.noSymptomCode}	
6.	<p>Examine Storage Diagnostic results for File System Check.</p> <p>Did File System Check PASS or FAIL?</p>	Pass	Go to step 7.	\$_{nodeText.yesSymptomCode}	
		Fail	Go to step 10.	\$_{nodeText.noSymptomCode}	
7.	<p>Examine Storage Diagnostic results for Bootable Volume Presence Check.</p> <p>Did Bootable Volume Check PASS or FAIL?</p>	Pass	Go to step 8.	\$_{nodeText.yesSymptomCode}	
		Fail	Go to step 10.	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
8.	Examine Storage Diagnostic results for Last OS Reinstall Check. Did Last OS Reinstall Check PASS or FAIL?	Pass	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair.	H99	
			Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.		
		Fail	Go to step 10.	\$(nodeText.noSymptomCode)	
9.	Identify the type of storage device affected: <ul style="list-style-type: none"> Hard disk drive (HDD) Flash storage / solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H05	HDD
		SSD	Replace the user's SSD/flash storage. Verify issue resolved.	H05	SSD
10.	Restart while holding down the Command-R keys to start up from the recovery partition. Does computer start up from recovery tools partition?	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	Go to step 11.	\$(nodeText.noSymptomCode)	
11.	If OS X is present but not able to restart from the recovery partition, or the partition is missing, consult article HT202294: OS X: About Recovery Disk Assistant to restore the partition. Restart from the new recovery partition, holding down Command-R during restart. Does computer start up from newly created recovery tools partition?	Yes	Go to step 12.	\$(nodeText.yesSymptomCode)	
		No	Go to step 16.	\$(nodeText.noSymptomCode)	
12.	In Disk Utility, select the Partition tab, then click the Option button to verify that the partition table is correctly set to GUID. Try to repair the partition using Disk Utility. Does Disk Utility successfully repair the partition?	Yes	Go to step 15.	\$(nodeText.yesSymptomCode)	
		No	Go to step 13.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
13.	<p>Connect the computer to a network with Internet access.</p> <p>Press Command-Option-R keys to start up the computer into the Internet recovery partition.</p> <p>Open Disk Utility and refer to instructions in article HT204743: Partition a problematic drive two times before recommending service or replacement to repartition the internal hard drive.</p> <p>This will force a rewrite of the partition table.</p> <p>Does Disk Utility successfully partition the drive without any errors?</p>	Yes	Go to step 14.	\${nodeText.yesSymptomCode}	
		No	Go to step 16.	\${nodeText.noSymptomCode}	
14.	<p>Quit Disk Utility and restore OS X software from Internet. Refer to article HT201314: OS X: About OS X Recovery for OS X recovery options and requirements.</p> <p>Does computer complete the start up process?</p>	Yes	Go to step 15.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	
15.	<p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Issue resolved. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

	Check	Result	Action	Code	Commodity
16.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	HDD	Go to step 17.	\${nodeText.yesSymptomCode}	
	Remove LCD panel with glass.				
	Attempt to isolate which mass storage component is involved with this issue: <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage / solid-state drive (SSD) <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Is this an HDD or SSD Issue?</p>	SSD	Go to step 23.	\${nodeText.noSymptomCode}	
17.	Disconnect and inspect hard drive cable. Look for damage on logic board connector and cable.	Yes	Go to step 18.	\${nodeText.yesSymptomCode}	
	Check for damaged or corroded cable connector and missing or bent pins on logic board connector.	No	Go to step 19.	\${nodeText.noSymptomCode}	
	Did you find damage to hard drive cable or logic board connectors?				
18.		Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
	Damage to multiple parts requires an escalation to ACS for repair approval.				
	Is damage limited to hard drive cable?	No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	P99	

	Check	Result	Action	Code	Commodity
19.	Reconnect the hard drive cable to the logic board.	Yes	Issue resolved by reseating hard drive cable. Verify issue resolved.	\${nodeText.yesSymptomCode}	
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Go to step 20.	\${nodeText.noSymptomCode}	
	Do all internal drive tests pass in Storage Diagnostic?				
20.	To troubleshoot this issue completely, the following known-good parts are required:	Yes	Go to step 21.	\${nodeText.yesSymptomCode}	
	<ul style="list-style-type: none"> Hard drive Hard drive cable 	No	Replace hard drive. Verify issue resolved.	H01	HDD
	Do you have immediate access to each of these known-good parts?				
21.	Substitute a known-good hard drive cable to test with user's hard drive.	Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Go to step 22.	\${nodeText.noSymptomCode}	
	Do all internal drive tests pass in Storage Diagnostic?				
22.	Continue to use known-good hard drive cable and substitute a known-good hard drive.	Yes	Replace hard drive. Reinstall user's hard drive cable. Verify issue resolved.	H01	HDD
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Replace logic board. Reinstall user's hard drive and cable. Verify issue resolved.	M19	MLB
	Do all internal drive tests pass in Storage Diagnostic?				
23.	Disconnect and inspect SSD/flash storage. Look for damage on logic board connector and SSD/flash storage.	Yes	Go to step 24.	\${nodeText.yesSymptomCode}	
	Check for damaged or corroded card edge connectors and missing or bent pins on logic board connector.	No	Go to step 25.	\${nodeText.noSymptomCode}	
	Did you find damage to SSD/flash storage or logic board connectors?				

	Check	Result	Action	Code	Commodity
24.	<p>Damage to multiple parts requires an escalation to ACS for repair approval.</p> <p>Is damage limited to SSD card or flash storage?</p>	Yes	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	P99	
25.	<p>Reconnect SSD or flash storage to logic board.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Issue resolved by reseating SSD/flash storage. Verify issue resolved.	\${nodeText.yesSymptomCode}	
		No	Go to step 26.	\${nodeText.noSymptomCode}	
26.	<p>To troubleshoot this issue completely, a known-good SSD or flash storage is required.</p> <p>Do you have immediate access to known-good SSD/flash storage?</p>	Yes	Go to step 27.	\${nodeText.yesSymptomCode}	
		No	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
27.	<p>Substitute a known-good SSD or flash storage.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
		No	Replace logic board. Reinstall the user's SSD/flash storage. Verify issue resolved.	M19	MLB

	Check	Result	Action	Code	Commodity
28.	<p>Confirm that the computer can successfully start up from the internal HDD/SSD/flash storage.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

SD Memory Card Cannot Be Inserted Into Slot

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Cannot insert SD card into slot.• Can insert SD card only part way into slot.• Card slot does not align with enclosure. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check that user's SD card is not warped or damaged, and that metal contacts are clean, intact and corrosion-free.2. Verify that SD card is the correct size. Card dimensions should be 32 mm x 24 mm x 2.1 mm. Note: Cards thicker than 2.1 mm are too thick and may damage the card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to article HT204384: About the SD and SDXC card slot for further information.3. Verify that computer's SD card slot is not obstructed in any way. Use a flashlight to look into slot to make sure nothing is already inserted. If so, carefully remove obstruction from slot. Try to reinsert SD card. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Insert known-good, formatted SD card into user's computer. Verify that it seats correctly.	Yes	Issue resolved. Defective or incompatible SD card. Advise user to contact SD card vendor for support. Refer them to article HT204384: About the SD and SDXC card slot for further information.	`\${nodeText.yesSymptomCode}`	
	Does known-good SD card seat correctly when inserted?	No	Go to step 2.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
2.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
	<p>Remove LCD panel with glass.</p> <p>Remove chin strap to avoid bending or damaging it while aligning logic board.</p> <p>Loosen but do not remove all logic board screws. You should be able to shift board position slightly, both left to right and up and down. Take care to avoid damaging cabling or other components while moving logic board.</p> <p>Insert known-good SD card again.</p> <p>Can you now insert known-good SD card correctly?</p>	No	Replace logic board. Verify issue resolved.	M27	MLB
3.	Hold the SD card reader in position and tighten all SD card reader screws. Insert the known-good SD card again.	Yes	Issue resolved with logic board alignment. Verify resolution.	\$(nodeText.yesSymptomCode)	
	Can you now insert and remove known-good SD card correctly?	No	Replace logic board. Verify issue resolved.	M27	MLB
4.	<p>Verify that a known-good SD memory card can be fully inserted into and ejected from slot and that it seats correctly.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

SD Memory Card Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">SD card does not appear on desktop or in System Information. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Make sure SD card is unlocked.Check that user's SD card is not warped or damaged and that metal contacts are clean, intact, and corrosion free.Verify that computer's SD card slot is not damaged or obstructed. Use a flashlight to inspect slot to make sure nothing is already inserted. If so, carefully remove obstruction from slot. Try to reinsert SD card.Verify that SD card is the correct size. Card dimensions should be 32 mm x 24 mm x 2.1 mm. Note: Cards thicker than 2.1 mm are too thick and may damage card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to article HT204384: About the SD and SDXC card slot for further specifications.Consult article HT204384: About the SD and SDXC card slot and check for compatible SD card type and format.<ul style="list-style-type: none">SD card slot can accommodate cards that are Standard SD (Secure Digital) 4 MB to 2 GB, SDHC (Secure Digital High Capacity) 4 GB to 32 GB, and SDXC (Secure Digital Extended Capacity) 4GB to 2 TB. MMC cards can also be used in this slot.While SDIO (Secure Digital Input Output) cards fit into and should not damage the card slot, they are not supported.MiniSD and Micro SD cards require adapters.For a more specific SD card type or format (wireless-enabled SD card or other SD card for example), make sure the correct driver is installed. OS X supports only standard SD memory cards; other cards may require specific driver software.Make sure Finder Preferences > General is set to show External Disks.Check for and apply latest software and firmware updates.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Insert a known-good, formatted SD card into user's computer. Verify that card seats correctly.	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
	Does known-good SD card seat correctly when inserted?	No	Go to "SD Memory Card Cannot Be Inserted Into Slot" troubleshooting flow.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
2.	Verify that a known-good SD card appears in Disk Utility and mounts in Finder. Verify that computer can read data from and write data to card. Can computer read from and write to known-good SD card?	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	Go to step 3.	\$(nodeText.noSymptomCode)	
3.	Start up user's computer with restore partition or up-to-date, bootable OS X volume. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Verify that a known-good SD card appears and mounts in Disk Utility and Finder. Can computer now read from and write to known-good SD card?	Yes	Repair permissions and directory using Disk Utility. If issue persists, restore OS X (with correct system build). Retest to verify resolution. Check that user has necessary driver software.	\$(nodeText.yesSymptomCode)	
		No	Go to step 4.	\$(nodeText.noSymptomCode)	
4.	Check System Information to verify that SD card reader is listed in USB devices. Does SD card reader appear in System Information?	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board, which includes SD card reader. Verify issue resolved.	M27	MLB
5.	Insert user's SD card into user's computer. Verify that it seats correctly. Does user's SD card seat correctly when inserted?	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to article HT204384: About the SD and SDXC card slot for further information.	\$(nodeText.noSymptomCode)	
6.	Verify that SD card appears in left column of Disk Utility. If card does not appear, eject and reinsert card. If inserted too slowly, card may not appear. Does SD card appear in Disk Utility?	Yes	Go to step 8.	\$(nodeText.yesSymptomCode)	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
7.	Insert user's SD card into a known-good computer. Verify that computer can read data from and write data to SD card.	Yes	Repair permissions and directory on user's computer using Disk Utility. If issue persists, restore OS X (with correct system build). Retest to verify resolution. Check that user has necessary driver software.	\$(nodeText.yesSymptomCode)	
	Can a known-good computer read from and write to user's SD card?	No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to article HT204384: About the SD and SDXC card slot for further information.	\$(nodeText.noSymptomCode)	
8.	Verify that user's SD card volume appears in Disk Utility and mounts in Finder.	Yes	Go to step 10.	\$(nodeText.yesSymptomCode)	
	Does card volume mount in Finder or Disk Utility?	No	Go to step 9.	\$(nodeText.noSymptomCode)	
9.	Format user's SD Card as OS X Extended Journaled with a GUID partition scheme.	Yes	Issue resolved by reformatting SD card. Verify resolution.	\$(nodeText.yesSymptomCode)	
	<p>Important: Make sure user has a valid backup first. If formatting is successful, retest SD card by writing data to and retrieving data from card.</p> <p>Were you able to reformat, then write to and read from the card successfully?</p>	No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to article HT204384: About the SD and SDXC card slot for further information.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
10.	<p>Test user's SD card by writing data to and retrieving data from card.</p> <p>Were you able to write to and read from user's card successfully?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Verify issue resolved.</p> <p>If the issue persists, contact ACS for additional support.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	<p>Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to article HT204384: About the SD and SDXC card slot for further information.</p>	\${nodeText.noSymptomCode}	
11.	<p>Verify that user's computer can successfully read from and write to a known-good SD card.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Thunderbolt Target Disk Mode Issues

Unlikely causes:

Battery, camera, camera/Microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer does not initiate Thunderbolt target disk mode connection.Computer does not show Thunderbolt floating icon after holding down T key during startup <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check for and apply latest software and firmware updates. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. The correct build includes Thunderbolt drivers that match the logic board Thunderbolt controller.Check System Information > Hardware > Thunderbolt to verify that the Thunderbolt hardware is recognized.Review the section entitled "How do I get the best performance from Thunderbolt?" in article HT204154: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that the computer has the latest Thunderbolt firmware version installed.Between similar Mac models, if both a Thunderbolt and a FireWire cable are connected while activating target disk mode, Thunderbolt-enabled device will be the default. If either a Thunderbolt or FireWire storage device are disconnected after successfully entering target disk mode, the corresponding icon should disappear from display. See article HT201164: About Thunderbolt to Thunderbolt cable (2.0 m).Try using a known-good Thunderbolt device or a Thunderbolt-capable computer in target disk mode. Refer to PH19021: Transfer files between two computers using target disk mode.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller. Is the proper OS X build installed?	Yes	Go to step 2.	\$(nodeText.yesSymptomCode)	
		No	Refer to article HT204319: OS X versions and builds included with Mac computers and reinstall correct OS X build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
2.	Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac with unique user ID (UID) and firmware version shown. Does System Information list Thunderbolt hardware?	Yes	Go to step 4.	\$(nodeText.yesSymptomCode}	
		No	Go to step 3.	\$(nodeText.noSymptomCode}	
3.	Reset PRAM by holding down Command-Option-P-R keys while booting, until you hear startup sound for the second time. Does System Information list Thunderbolt hardware?	Yes	Go to step 4.	\$(nodeText.yesSymptomCode}	
		No	Go to “Thunderbolt Port Not Recognized” troubleshooting flow.	\$(nodeText.noSymptomCode}	
4.	Inspect Thunderbolt ports on user's computer for physical damage, burnt connectors or misalignment. Does Thunderbolt port show any damage?	Yes	Go to step 8.	\$(nodeText.yesSymptomCode}	
		No	Go to step 5.	\$(nodeText.noSymptomCode}	
5.	To troubleshoot this issue completely, the following known-good parts are required: <ul style="list-style-type: none">Thunderbolt-capable MacThunderbolt to Thunderbolt cable (2.0 m) Do you have immediate access to each of these known-good parts?	Yes	Go to step 6.	\$(nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Request ACS help checking latest updates and System Information > Hardware > Thunderbolt device tree. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
6.	<p>Start up a known-good Thunderbolt-capable Mac in target disk mode by holding down T key. Connect known-good computer to user's computer using a known-good Thunderbolt cable. Start up user's computer and verify whether hard drive of te known-good computer appears on desktop of user's computer.</p> <p>Verify all available Thunderbolt ports.</p> <p>Does hard drive on known-good Mac mount to user's computer while using known-good cable?</p>	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
		No	Go to step 7.	\${nodeText.noSymptomCode}	
7.	<p>Verify that System Information > Hardware > Thunderbolt on user's computer lists Thunderbolt connection and target disk mode information for known-good computer.</p> <p>Does System Information list Thunderbolt target disk mode information?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support. Inform ACS that user's computer cannot mount hard drive on a known-good iMac while in Thunderbolt target disk mode, while it does show Thunderbolt connection in System Information.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Replace logic board. Thunderbolt hardware is present, but not fully functioning. Verify issue resolved.	M33	MLB

	Check	Result	Action	Code	Commodity
8.	Check that physical damage or improper logic board mounting has not caused Thunderbolt port(s) to be out of alignment. Connect a Mini DisplayPort connector to Thunderbolt ports while mounting logic board to ensures proper alignment for cable insertion and removal. Rule out accidental damage before proceeding. Did logic board realignment correct the Thunderbolt port issue?	Yes	Go to step 5.	`\${nodeText.yesSymptomCode}`	
		No	Replace logic board. Verify issue resolved.	M24	MLB
9.	Inspect user's Thunderbolt to Thunderbolt (2.0 m) cable for physical damage, such as contamination or burnt connectors on either end of the cable. Is user's Thunderbolt cable damaged?	Yes	Replace the Thunderbolt to Thunderbolt (2.0 m) cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Go to step 10.	`\${nodeText.noSymptomCode}`	
10.	Connect user's Thunderbolt to Thunderbolt cable (2.0 m) to both computers. Start up known-good computer in target disk mode by holding down T key during startup. Restart user's computer and verify that known-good computer's hard drive mounts to desktop of user's computer. Does known-good computer's drive mount to user's desktop?	Yes	Go to step 11.	`\${nodeText.yesSymptomCode}`	
		No	Replace Thunderbolt to Thunderbolt cable (2.0 m). Verify issue resolved.	X26	EXTERNAL CABLE
11.	Continue verification of user's Thunderbolt to Thunderbolt cable (2.0 m) cable. Start up user's computer in target disk mode by holding down T key during startup. Restart known-good computer and verify that user's computer's hard drive mounts to desktop of known-good computer. Does user's computer's drive mount to known-good computer's desktop?	Yes	User's iMac and Thunderbolt cable pass inspections. Thunderbolt target disk mode issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 12.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
12.	<p>Substitute a known-good Thunderbolt to Thunderbolt cable (2.0 m) between known-good computer and user's computer. Restart user's computer in target disk mode by holding down T key during startup. Restart known-good computer and verify that user's computer's hard drive mounts to the desktop of known-good computer.</p> <p>Does user's computer's drive mount to known-good computer's desktop?</p>	Yes	Replace Thunderbolt to Thunderbolt cable (2.0 m). Verify issue resolved.	X26	EXTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support. Inform ACS that user's computer can mount a known-good Thunderbolt target disk mode computer hard drive, but cannot support being a target disk for other hosts.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
13.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID, most recent firmware version, and correct link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Burnt Smell / Odor

Unlikely causes:

Rear enclosure, stand

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer emits a burnt, smoky, or other unusual odor <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Verify that computer is source of odor.Disconnect all third-party devices to eliminate external devices as source of odor.Odors can be related to how new the product is. Refer to article HT202324: New equipment: Odors may be present short-term.Determine whether this is a safety issue. Refer to article OP44: SERVICE: Handling Potential Product Safety Issues.Inspect enclosure and components for obvious signs of burning or smoky residue. Check rear vents, slots, ports, and power cord. Refer to article HT203529: Smoke emitted may be from failed component.Inspect air intake vents and outlets for any obstructions. Make sure air can flow freely into and out of enclosure.Clean enclosure to eliminate odors resulting from external contamination. Refer to article HT204172: Cleaning your Apple products. Explain cause to user.Verify functionality of computer. If computer is nonfunctional, troubleshoot that first as a separate issue. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Closely inspect computer for a possible safety issue.</p> <p>Have you identified any safety issues?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for safety-related issues. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p> <p>Refer to article OP44: SERVICE: Handling Potential Product Safety Issues.</p>	T99	
		No	Go to step 2.	\${nodeText.noSymptomCode}	
2.	<p>Odor can be related to external contamination. Inspect computer exterior for contamination or lack of cleanliness.</p> <p>Can you determine that odor is caused by external contamination?</p>	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	Go to step 4.	\${nodeText.noSymptomCode}	
3.	<p>Thoroughly clean entire enclosure and all external surfaces. Refer to article HT204172: Cleaning your Apple products. Explain cause to the user.</p> <p>Does user agree that odor is due to external contamination?</p>	Yes	Issue resolved. Verify resolution.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
4.	<p>Odors can be related to how new the product is. Refer to article HT202324: New equipment: Odors may be present short-term.</p> <p>Can you determine that odor is due to newness?</p>	Yes	Go to step 5.	\${nodeText.yesSymptomCode}	
		No	Go to step 6.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
5.	<p>Explain to user that new computers can sometimes emit an odor similar to odors generated by new carpeting or a new car. In most cases, odor dissipates after a brief period.</p> <p>Refer user to article HT202324: New equipment: Odors may be present short-term.</p> <p>Does user agree odor is related to computer's newness?</p>	Yes	Issue resolved. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
6.	<p>Inspect each module and its associated cables for signs of burnt or damaged components, smoke residue or other traces of burning, and melted or damaged wiring.</p> <p>Have you identified a component failure as source of odor?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS to troubleshoot burnt or failed components.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	
7.	<p>Closely inspect internal components and enclosure for indications of physical damage or internal contamination.</p> <p>Can you identify signs of internal damage or contamination?</p>	Yes	Go to step 8.	\$(nodeText.yesSymptomCode)	
		No	Go to step 9.	\$(nodeText.noSymptomCode)	
8.	<p>Inform the user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Proceed with out-of-warranty repair. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Issue resolved. Return computer to user using correct positioning.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
9.	<p>Run computer for several hours and check for the issue/odor. Test with both Apple Service Diagnostic (ASD) EFI and ASD OSX. If no functional failure is detected, use correct positioning to explain to user that odor is most likely related to external contamination or newness of computer.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Computer Runs Hot

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, HDD data cable, HDD power cable, left speaker, memory, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Computer feels unusually warm.• Fan is not operating.• Fan is not functioning to its full capacity.• Fan runs constantly at high speeds. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Run Mac Resource Inspector (MRI) to verify correct operation of sensors and fan.2. Check for and apply latest software and firmware updates.3. Inspect fan performance during operation to make sure fan is spinning. Check that vents are not blocked, and if necessary, use compressed air to remove dust or debris from rear fan exhaust.4. Compare computer's operating temperature to a known-good, similarly configured computer.5. Check for runaway applications using article HT203184: Apps can affect Mac performance, battery runtime, temperature, and fan activity. Follow instructions to halt any processes that are using excessive system resources.6. Processor-intensive/graphics-intensive applications and system processes may cause the enclosure to feel warm. Use Activity Monitor to identify these types of programs and explain issue to user.7. Reset SMC using procedure listed for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac.8. Verify that computer's internal hard drive or solid-state drive (SSD) / flash storage is an Apple-installed part. Compare hard drive information in System Information to the Apple Hard Drives Matrix in article SM155: Hard Drives Matrix to determine whether user's installed drive is one of OEM drives available for this computer configuration. Third-party hard drives without correct firmware or thermal sensors, or outside this computer's specifications, may cause computer to run hot or permanently activate fan at full speed. In such cases, inform user that computer has been modified from its original, supported configuration, and that such a repair would not be covered under Apple warranty. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) to check for correct fan operation and current status of thermal sensors. MRI will report a failure if a fan isn't rotating or a sensor is undetected or exceeding thermal values. Does computer pass all MRI checks?	Yes	Go to step 2.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 8.	`\${nodeText.noSymptomCode}`	
2.	Use CSD to verify proper function of the following subsystems: <ul style="list-style-type: none">• SMC• Fan• Thermal sensors• CPU–heat sink thermal interface Does computer pass all CSD tests?	Yes	Computer passed all CSD tests. Verify operation and refer user to article HT202179: Learn about the fans in your Mac .	`\${nodeText.yesSymptomCode}`	
		No	Go to step 3.	`\${nodeText.noSymptomCode}`	
3.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding. Remove LCD panel with glass. Inspect fan and heat sink fin stacks. Partial disassembly of computer may be required to access fan and heat sink. Use an ESD-safe vacuum to remove any dust or debris. Reassemble and retest using CSD. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Does computer pass all CSD checks?	Yes	Issue resolved by cleaning airflow. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 4.	`\${nodeText.noSymptomCode}`	
4.	To troubleshoot this issue completely, a known-good fan is required. Do you have immediate access to known-good fan?	Yes	Go to step 5.	`\${nodeText.yesSymptomCode}`	
		No	Replace non-rotating or slower fan. Verify issue resolved.	X22	OTHER ELECTRIC
5.	Substitute a known-good fan and retest using MRI and CSD. Does computer now pass MRI and CSD tests?	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 6.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
6.	To troubleshoot this issue completely, a known-good logic board is required.	Yes	Go to step 7.	`\${nodeText.yesSymptomCode}`	
	Do you have immediate access to a known-good logic board?	No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
7.	Continue to use known-good fan. Substitute a known-good logic board. Reassemble computer and retest with MRI.	Yes	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
	Do both known-good fan and logic board pass MRI and run-in tests?	No	Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
8.	A disconnected fan will prevent proper cooling and cause thermal sensors to exceed expected values.	Yes	Go to step 9.	`\${nodeText.yesSymptomCode}`	
	Does MRI report a fan motor test failure?	No/Other	Go to step 15.	`\${nodeText.noSymptomCode}`	
9.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 10.	`\${nodeText.yesSymptomCode}`	
	<p>Remove LCD panel with glass.</p> <p>Use TP913: iMac (21.5-inch): Functional Overview or TP816: iMac (27-inch): Functional Overview to locate affected fan connection to logic board. Disconnect fan cable connector and inspect logic board and fan cable connector pins for damage.</p> <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Is there any cable or connector damage on fan or logic board?</p>	No	Go to step 12.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
10.	Identify whether fan, logic board, or both are damaged.	Yes	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair.	L99	
	Are both fan and logic board damaged?		Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.		
		No	Go to step 11.	\$(nodeText.noSymptomCode)	
11.	Identify whether fan or logic board is damaged.	Fan	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
	Which part is damaged?	Logic Board	Replace logic board. Verify issue resolved.	M24	MLB
12.	Remove all fan screws and extract fan to reveal heat sink or fan air duct. Use an ESD-safe vacuum to remove dust or debris from inner side of heat sink fin stack. Clean fan rotor blades. Reinstall fan and reseal fan cable connection to logic board. Reassemble and retest with MRI.	Yes	Issue resolved by cleaning and reseating fan connection. Verify resolution.	\$(nodeText.yesSymptomCode)	
	Does computer pass fan motor check?	No	Go to step 13.	\$(nodeText.noSymptomCode)	
13.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 14.	\$(nodeText.yesSymptomCode)	
	Do you have immediate access to a known-good fan?	No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
14.	Substitute a known-good fan, and retest using MRI.	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
	Does computer now pass fan motor check?	No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
15.	Any under/overheated, clogged, disconnected, shorted, or failing sensor will cause computer to operate fan at higher speed(s).	Yes	Go to step 16.	\$(nodeText.yesSymptomCode)	
	Does MRI report a Txxx thermal sensor test failure?	No/Other	Go to step 27.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
16.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 17.	`\${nodeText.yesSymptomCode}`	
	<p>Remove LCD panel with glass.</p> <p>Accumulated dust in fan or heat sink may not permit proper cooling.</p> <ul style="list-style-type: none"> Remove all fan screws and extract fan to reveal heat sink. Use an ESD-safe vacuum to remove dust or debris. Clean fan rotor blades using soft brush. Reinstall fan and reseal fan cable connection to logic board. Reassemble and retest with MRI. <p>Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.</p> <p>Does MRI still report a Txxx thermal sensor test failure?</p>	No	Issue resolved by cleaning and reseating fan cable connection. Verify resolution.	`\${nodeText.noSymptomCode}`	
17.	Identify whether sensor is one of the following: TCXr, TC0p, TG0d, TG0p, TPCD, TA0p, TM0p, TM1p, TM2p, TM3p, Tm0p, Tm1p, Tm2p, Tb0p.	Yes	Replace logic board. Verify issue resolved.	M23	MLB
	Is failing thermal sensor listed?	No	Go to step 18.	`\${nodeText.noSymptomCode}`	
18.	Identify whether sensor currently failing MRI test is TH0o or TH1R.	Yes	Go to step 19.	`\${nodeText.yesSymptomCode}`	
	Is TH0o or TH1R thermal sensor failing test?	No	Go to step 23.	`\${nodeText.noSymptomCode}`	
19.	Verify in article SM155: Hard Drives Matrix that the installed hard drive or SSD/flash storage model is compatible with this computer configuration.	Yes	Go to step 20.	`\${nodeText.yesSymptomCode}`	
	Is installed HDD/SDD/flash storage compatible with this model?	No	Unsupported HDD/SSD installed, or missing/incorrect hard drive thermal sensor. Check with user for out-of-warranty resolution. Verify resolution.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
20.	Identify the type of storage device affected: <ul style="list-style-type: none"> • TH0o - Hard Disk Drive (HDD) • TH0O - Hard Disk Drive (HDD) • TH1R - Flash Storage / Solid-State Drive (SSD) Is the affected device an HDD or an SSD/flash storage?	HDD	Go to step 21.	`\${nodeText.yesSymptomCode}`	
		SSD/Flash Storage	Replace the user's SSD/flash storage. Verify issue resolved.	H85	SSD
21.	To troubleshoot this issue completely, a known-good HDD data cable is required. Do you have immediate access to a known-good HDD cable?	Yes	Go to step 22.	`\${nodeText.yesSymptomCode}`	
		No	Replace the user's hard drive. Verify issue resolved.	H85	HDD
22.	Substitute a known-good HDD data cable and retest using MRI. Does computer now pass the THxx sensor check?	Yes	Replace the user's hard drive data cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Reinstall user's HDD data cable. Replace the user's hard drive. Verify issue resolved.	H85	HDD
23.	Identify whether sensor currently failing MRI test is Tp2h. Is Tp2h thermal sensor failing test?	Yes	Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
		No	Go to step 24.	`\${nodeText.noSymptomCode}`	
24.	Identify whether sensor currently failing MRI test is TL0p or TL1p. Is TL0p or TL1p thermal sensor failing test?	Yes	Go to step 25.	`\${nodeText.yesSymptomCode}`	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	
25.	To troubleshoot this issue completely, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD display panel with glass?	Yes	Go to step 26.	`\${nodeText.yesSymptomCode}`	
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD

	Check	Result	Action	Code	Commodity
26.	<p>Substitute a known-good LCD panel with glass, and retest using MRI.</p> <p>Does MRI still report a TL0p or TL1p thermal sensor test failure?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
27.	<p>Other voltage and current sensors are also tested by MRI. Any failure to read them or any unexpected value will lead MRI to report a test failure.</p> <p>Does MRI report a Vxxx or lxxx test failure?</p>	Yes	Go to step 28.	`\${nodeText.yesSymptomCode}`	
		No/Other	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
28.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 29.	`\${nodeText.yesSymptomCode}`	
	Remove LCD panel with glass. Some power-related sensors are located in power supply, but are read through a SMBus connection to logic board. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed.	No/Other	Go to step 32.	`\${nodeText.noSymptomCode}`	
29.	Does MRI report a VDxx or IDxx test failure?				
	Reseat DC power cable connection to logic board. Reassemble and retest, using MRI.	Yes	Go to step 30.	`\${nodeText.yesSymptomCode}`	
30.	Does MRI still report a VDxx or IDxx sensor test failure?	No	Issue resolved by reseating DC power cable connection between power supply and logic board. Verify resolution.	`\${nodeText.noSymptomCode}`	
	To troubleshoot this issue completely, a known-good power supply is required.	Yes	Go to step 31.	`\${nodeText.yesSymptomCode}`	
31.	Do you have immediate access to a known-good power supply?	No	Reinstall user's DC power cable. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
	Substitute a known-good power supply, reassemble and retest using MRI.	Yes	Reinstall user's DC power cable and power supply. Replace logic board. Verify issue resolved.	M18	MLB
32.	Does MRI still report a VDxx or IDxx sensor test failure?	No	Reinstall user's DC power cable. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
	Most voltage and current regulators are located on logic board. To troubleshoot this issue completely, a known-good logic board is required.	Yes	Go to step 33.	`\${nodeText.yesSymptomCode}`	
32.	Do you have immediate access to a known-good logic board?	No	Replace logic board. Verify issue resolved.	M18	MLB

	Check	Result	Action	Code	Commodity
33.	Substitute a known-good logic board, reassemble and retest using MRI.	Yes	Reinstall user's logic board. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
	Does MRI still report a Vxxx or Ixxx sensor test failure?	No	Replace logic board. Verify issue resolved.	M18	MLB
34.	Verify that computer no longer overheats during use. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

Mechanical/Physical/Cosmetic Damage

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Broken glass• Bent stand• Broken hinge• Stripped screw/head• Stripped screw boss/threads• Dented or scratched enclosure• Cracked LCD• Scorched or melted LCD• LCD impact damage <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Inspect computer and discuss nature of issue with user. Determine whether user wants to proceed with repair (despite possible accidental damage) or pursue other service options. Click "No" to proceed with further troubleshooting.</p>

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Determine cause of damage or defect: user/technician, environment, accidental damage, or abuse. Is an Apple agent responsible for damage or defect on computer?	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for assistance with Apple-related accidental damage.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	<p>Proceed with resolution or repair using proper positioning. Inform user that computer failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p>	L99	

Noise/Hum/Vibration

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Buzzing noise• Rattling noise• Ticking noise• Squeaking noise• Humming noise• High frequency noise• Mechanical vibration <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Work with user to reproduce issue and isolate source of noise. Differentiate whether noise is coming from computer or a connected peripheral. Disconnect all third-party peripherals to isolate the source of noise.2. Determine whether sound is normal or abnormal. Refer to article TS3204: iMac: Evaluating System noises for more information.3. If iMac fan runs at full speed after computer turns on, you may need to reset iMac's SMC. Refer to articles HT204463: iMac: Fans run at full speed after computer turns on and HT202179: Learn about the fans in your Mac for more information. Reset SMC using procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC).4. Verify that vents on bottom and back of computer are free of dust and other obstructions that might inhibit proper airflow through computer.5. Launch Applications > Utilities > Activity Monitor. Determine whether an application or process is consuming a high percentage of CPU bandwidth. CPU-intensive applications can cause fan to run fast in order to maintain proper internal computer temperatures. If needed, quit application or restart the computer to resolve issue. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with Power Supply Covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect any peripheral devices, cards, or cables attached to computer. Has the noise been eliminated?	Yes	Issue resolved. Issue caused by ground loop induced by third-party devices. Advise user to connect all devices to a common power outlet or contact device manufacturer for support.	\${nodeText.yesSymptomCode}	
		No	Go to step 2.	\${nodeText.noSymptomCode}	
2.	Tilt display to hinge limits to determine whether mechanical noise is generated by hinge mechanism. Is the noise coming from iMac's display hinge?	Yes	Go to "Stand/Hinge Issues" troubleshooting flow.	\${nodeText.yesSymptomCode}	
		No	Go to step 3.	\${nodeText.noSymptomCode}	
3.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding. Remove LCD panel with glass. Connect computer to AC power and listen carefully around power supply to verify whether it is source of noise. Warning: HIGH VOLTAGE: The power supply remains energized whenever the computer is plugged in, whether or not the computer has been turned on. Use extreme caution when troubleshooting with the display panel removed. Is noise coming from iMac's power supply?	Yes	Replace power supply. Verify issue resolved.	P04	POWER SUPPLY
		No	Go to step 4.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
4.	Shut down computer. If you reinstalled LCD panel with glass, remove it.	Yes	Issue resolved by removing loose objects inside chin area.	\$(nodeText.yesSymptomCode)	
	Hold computer firmly with both hands and invert computer while gently shaking it, to attempt to dislodge and remove any loose screws or other foreign objects that may have fallen down inside the computer into the chin area.				
	Loose objects in the chin area can cause noise or vibration, especially during audio playback.	No	Go to step 5.	\$(nodeText.noSymptomCode)	
	Briefly retest for noise, hum, or vibration.				
5.	Has noise been eliminated?				
	Shut down computer and let it cool off fully. Check for noise, hum or vibration during startup when computer is cold.	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Go to step 12.	\$(nodeText.noSymptomCode)	
	Does issue happen on or after a cold startup?				
6.	An unreadable thermal sensor can cause fan to run excessively. Run Mac Resource Inspector (MRI) to check thermal sensors.	Yes	Go to “Computer Runs Hot” troubleshooting flow.	\$(nodeText.yesSymptomCode)	
		No	Go to step 7.	\$(nodeText.noSymptomCode)	
	Does MRI report any thermal sensor failures?				
7.	Excessive fan operation may also occur if computer is unable to read fan speed. Check MRI results for fan (motor) sensor test results.	Yes	Go to step 8.	\$(nodeText.yesSymptomCode)	
		No	Go to step 10.	\$(nodeText.noSymptomCode)	
	Does MRI report any fan (motor) failures?				
8.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 9.	\$(nodeText.yesSymptomCode)	
		No	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
	Do you have immediate access to known-good fan?				
9.	Substitute known-good fan and retest with MRI.	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Reinstall user's fan. Replace the logic board. Verify issue resolved.	M23	MLB
	Does known-good fan pass fan (motor) test in MRI?				
10.	Disconnect fan and briefly retest for noise, hum, or vibration.	Yes	Go to step 11.	\$(nodeText.yesSymptomCode)	
		No	Go to step 12.	\$(nodeText.noSymptomCode)	
	Has noise been eliminated?				

	Check	Result	Action	Code	Commodity
11.	Verify whether any tape, gasket, cable label, cable, or other material is touching fan blades and causing a ticking or buzzing noise. Secure material so it does not touch fan blades. If tape adhesive has lost its stickiness, replace that section of tape.	Yes	Issue resolved by securing internal components or material to prevent touching fan blades. Verify resolution.	\$(nodeText.yesSymptomCode}	
	Remove fan and rotate blades. Verify that fan blades spin smoothly without interference from fan housing, cables, tape, gaskets or other components.				
	Reinstall fan while carefully ensuring that there are no cables routed under or near fan assembly that might cause interference with fan blades. After reassembling computer, verify whether noise issue is resolved.	No	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
	Has noise been eliminated?				
12.	Depending on configuration, there may or may not be a hard drive installed. Other configurations may have either a flash storage card or both flash storage and HDD.	Yes	Go to step 13.	\$(nodeText.yesSymptomCode}	
		No	Go to step 14.	\$(nodeText.noSymptomCode}	
	Is a hard drive installed in computer?				
13.	Remove internal hard drive and start up computer from recovery partition or an up-to-date, bootable OS X volume.	Yes	Go to “HDD Noisy” troubleshooting flow.	\$(nodeText.yesSymptomCode}	
		No	Go to step 14.	\$(nodeText.noSymptomCode}	
	Has noise been eliminated?				
14.	Play sound sample at loud and soft volume levels to determine whether noise is caused by left/right speakers or amplifier circuit. Plug in external headphones to identify whether noise comes from audio out or from other source. Mute computer volume. Verify whether issue still occurs.	Yes	Go to “Distorted Audio from Internal Speaker(s)” troubleshooting flow.	\$(nodeText.yesSymptomCode}	
		No	Go to step 15.	\$(nodeText.noSymptomCode}	
	Has noise been eliminated?				
15.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 16.	\$(nodeText.yesSymptomCode}	
		No	Go to step 17.	\$(nodeText.noSymptomCode}	
	Do you have immediate access to a known-good fan?				
16.	Substitute known-good fan and retest.	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Go to step 18.	\$(nodeText.noSymptomCode}	
	Has noise been eliminated?				

	Check	Result	Action	Code	Commodity
17.	Disconnect fan and briefly retest for noise, hum, or vibration.	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
	Has noise been eliminated?	No	Go to step 18.	\$(nodeText.noSymptomCode)	
18.	With hard drive and fan disconnected, briefly retest once again while listening closely for any noise, hum, or vibration coming from logic board and heat sink assembly.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	<p>Inspect logic board and heat sink assembly for any damage that may have occurred during removal or replacement.</p> <p>Logic board and heat sink assembly must be treated as a single unit during removal or replacement. All screws must be removed from both components prior to physically pulling or pushing either component.</p> <p>Any mishandling of heat sink assembly that is attached to logic board can cause damage to heat pipes connecting these components.</p> <p>If heat pipes become even slightly damaged (bent or kinked for example), normal heat removal cycle can become disrupted, causing a repetitive hammering noise from this area. Damage may not be visibly noticeable.</p> <p>Noise may be mistaken for a faulty hard drive. Check for this noise with hard drive and fan disconnected.</p> <p>Is there noise coming from logic board and heat sink assembly?</p>	No	Go to step 19.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
19.	<p>Noise may be related to interference from other electrical devices operating near computer or plugged into same power outlet. See whether noise is eliminated when computer runs in a different location on a different circuit.</p> <p>Has noise been eliminated?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Stand/Hinge Issues

Unlikely causes:

There are no unlikely causes for this issue.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Bent standBroken hingeStripped screw/headStripped screw boss/threadsLoose stand and/or hinge <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Inspect computer and discuss nature of issue with user. Determine whether user wants to proceed with repair (despite possible accidental damage) or pursue other service options.Click “No” to proceed with further troubleshooting. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">TP833: iMac and Displays: Power Supply Cover InstructionsTP820: iMac (27-inch): SafetyTP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Determine cause of damage or defects: user/technician, environment, accidental damage, or abuse.	Yes	ESCALATION REQUIRED. Contact ACS for assistance with Apple-related accidental damage. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
	Is an Apple agent responsible for damage or defect on the computer?	No	Go to step 2.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
2.	<p>Inspect stand to determine whether it requires replacement.</p> <p>Verify that stand securely holds computer in its upright position without wobbling when placed on a hard, smooth, even surface.</p> <p>Is stand damaged or defective?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Replace stand. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Go to step 3.	\${nodeText.noSymptomCode}	
3.	<p>Inspect hinge mechanism to determine whether it requires replacement.</p> <p>Adjust computer back and forth on its hinge, listening for hinge noise. Check feel of the hinge. Its movement should feel firm—not tight or loose—as it holds the iMac in position. Hinge should operate smoothly along its entire travel.</p> <p>Is hinge mechanism damaged or defective?</p>	Yes	<p>Replace hinge mechanism. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p>	X12	PIECE PART
		No	Go to step 4.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
4.	Place the customer's iMac on a solid, flat surface.	Yes	ESCALATION REQUIRED. Replace the rear housing. Verify issue resolved. Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty . Contact ACS for additional support regarding warranty coverage for this part. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
	Have another person apply downward pressure to the stand to hold it down on that solid surface.				
	Firmly grasp both sides of the iMac enclosure, and gently attempt to rotate the entire enclosure left and right while facing the display. The enclosure should not be able to move in this direction.				
4.	Compare this behavior with a known-good, similar iMac model.	No	Go to step 5.	{nodeText.noSymptomCode}	
	If the enclosure rotates an abnormal amount, the mechanism mounts inside the rear enclosure may no longer be securely attached, which may require a rear enclosure replacement.				
5.	Does the iMac's enclosure rotate an abnormal amount?	Yes	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
	Place the user's iMac on a solid, flat surface and check if one side of the display appears to sit higher or lower than the other side.				
5.	Does one side of the iMac appear to sit higher or lower than the other side?	No	Go to step 6.	{nodeText.noSymptomCode}	
6.	Verify that both stand and hinge operate properly and that they securely hold the iMac upright in all appropriate positions.	Yes	Issue resolved.	{nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
	Is issue resolved?				

Intermittent Shutdown

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, left speaker, memory, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Shuts down during startup• Shuts down unexpectedly during use• Computer restarts spontaneously• Powers off when waking from sleep <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Collect details from user regarding shutdown occurrence and system configuration: when shutdown occurs (for example, after running for a while); frequency of shutdowns; which applications are running; and shutdown repeatability.2. Make sure that power cord is securely attached to back of computer, and is not hindered by a desk or other furniture.3. Plug computer directly into an AC outlet rather than into a surge protector or UPS.4. Open System Preferences > Energy Saver > Schedule and make sure that a shut down event is not scheduled.5. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: About OS X Recovery.6. Hold Shift key during startup to put computer into safe mode. See article HT201262: Try safe mode if your Mac doesn't finish starting up.7. Run Mac Resource Inspector (MRI) to check fan (motor) speed and thermal/voltage/current sensor detection and values.8. Reset SMC using the procedure listed for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac.9. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.10. If the iMac is internally equipped with both a hard disk drive (HDD) and a solid-state drive (SSD), refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run diagnostics or Macintosh Resource Inspector (MRI) and consult MRI logs to check for fan (motor) or sensor failures.	Yes	Go to step 2.	\$_{nodeText.yesSymptomCode}\$	
	Sensor(s) that indicate they are out of normal operating range or an inoperative fan can cause intermittent shutdowns.	No	Go to step 6.	\$_{nodeText.noSymptomCode}\$	
	Did diagnostics/MRI report any fan or sensor failures?				
2.	MRI may report a voltage out of range error, either over- or under-voltage, from the power supply. This out-of-range voltage issue with power supply can cause intermittent shutdowns.	Yes	Go to step 3.	\$_{nodeText.yesSymptomCode}\$	
	iMac power supply related sensor names are: <u>Sensor - MRI Sensor Name</u> Voltage (VDPr) - Primary AC/DC Voltage (VDSR) - Secondary AC/DC Voltage (VD0R) - 12V S0 Voltage (VD2R) - Power Supply 12V S0	No	Go to step 11.	\$_{nodeText.noSymptomCode}\$	
	Any one of the above sensors being out of range is typically related to power supply or incoming AC power.				
	Did MRI report failure of a power supply sensor listed above?				
3.	Remove AC power and wait for power supply to discharge. Open computer. Inspect and reseal DC power cable while looking for cable pinch, wire exposure, or connector damage. Also inspect power supply and logic board connectors for damaged housing, and bent or burnt pins.	Yes	Go to step 4.	\$_{nodeText.yesSymptomCode}\$	
	Did you find any damaged components?	No	Go to step 5.	\$_{nodeText.noSymptomCode}\$	

	Check	Result	Action	Code	Commodity
4.	<p>Identify whether DC power cable is the only damaged component. Damage to multiple parts will require an escalation to ACS.</p> <p>Is damaged limited to DC power cable only?</p>	Yes	Replace DC power cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
5.	<p>After reseating DC power cable, use an external monitor or connect LCD panel to rerun MRI and verify if power supply voltage sensor still gives an error.</p> <p>iMac power supply related sensor names are:</p> <p><u>Sensor - MRI Sensor Name</u></p> <p>Voltage (VDPr) - Primary AC/DC</p> <p>Voltage (VDSR) - Secondary AC/DC Voltage (VD0R) - 12V S0</p> <p>Voltage (VD2R) - Power Supply 12V S0</p> <p>Did MRI report failure of a power supply sensor listed above?</p>	Yes	Replace power supply. Verify issue resolved.	P02	POWER SUPPLY
		No	Go to step 6.	<p>Go to step 6.</p> <p>Go to step 6.</p>	<p>Go to step 6.</p> <p>Go to step 6.</p>
6.	<p>Start up from internal drive and attempt to reproduce shutdown symptom(s).</p> <p>Can you reproduce shutdown event?</p>	Yes	Go to step 7.	<p>Go to step 7.</p> <p>Go to step 7.</p>	<p>Go to step 7.</p> <p>Go to step 7.</p>
		No	Go to step 8.	<p>Go to step 8.</p> <p>Go to step 8.</p>	<p>Go to step 8.</p> <p>Go to step 8.</p>

	Check	Result	Action	Code	Commodity
7.	Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from recovery partition. See article HT201314: About OS X Recovery .	Yes	ESCALATION REQUIRED. Contact ACS for assistance troubleshooting Previous Shutdown Causes. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	
	Does shutdown issue persist?	No	Repair disk directory using Disk Utility. If the issue persists after repair, refer to article HT204319: OS X versions and builds included with Mac computers and install the correct OS X version and build on user's hard drive. Check for and apply latest software and firmware updates. Verify issue resolved.	\${nodeText.noSymptomCode}	
8.	Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.	Yes	Go to step 9.	\${nodeText.yesSymptomCode}	
	Did computer shut down unexpectedly?	No	No failure found during repeated diagnostic testing. Using correct positioning, return computer to user with no trouble found. Verify that the issue is resolved.	\${nodeText.noSymptomCode}	
9.	Check diagnostic logs to see whether diagnostics is conducting the same test each time computer unexpectedly shuts down.	Yes	Go to step 10.	\${nodeText.yesSymptomCode}	
	Does computer consistently shut down during the same diagnostics test?	No	Replace logic board. Verify issue resolved.	M23	MLB

	Check	Result	Action	Code	Commodity
10.	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly until the computer unexpectedly shuts down, then immediately run MRI to see if a sensor error is found while the computer is still hot.</p> <p>Verify if MRI (or MRI log on AST server) reports any sensor test failures.</p> <p>Does MRI report any sensor test failures?</p>	Yes	Go to step 11.	\$_{nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for assistance troubleshooting Previous Shutdown Causes.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
11.	<p>Determine specific type of failure reported in diagnostics: thermal/fan sensor or voltage/current sensor.</p> <ul style="list-style-type: none"> • MRI thermal sensors begin with Txxx. • MRI electrical voltage sensors begin with Vxxx. • MRI electrical current sensors begin with Ixxx. <p>Which sensor failure does diagnostics report?</p>	Voltage/Current Sensor	Replace logic board. Verify issue resolved.	M23	MLB
		Thermal/Fan Sensor	Go to step 12.	\$_{nodeText.noSymptomCode}	
12.	<p>Identify specific type of failure reported in MRI/diagnostics: thermal sensor or fan (motor) error.</p> <p>MRI thermal sensors begin with Txxx.</p> <p>Which sensor failure does diagnostics report?</p>	Fan (Motor)	Go to step 13.	\$_{nodeText.yesSymptomCode}	
		Thermal	Go to step 18.	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
13.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>iMac (Late 2012 and later) computers have a single fan. Locate fan and inspect fan cable and connector for damage, and make sure fan blades are not obstructed.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Is fan damaged or blocked?</p>	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 14.	\$(nodeText.noSymptomCode)	
14.	<p>Inspect fan cable connectors on logic board for damaged pins, and missing or broken connector housing.</p> <p>Is logic board damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 15.	\$(nodeText.noSymptomCode)	
15.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reseat fan cable connector to logic board and retest using MRI/diagnostics.</p> <p>Does diagnostics still report a fan error?</p>	Yes	Go to step 16.	\$(nodeText.yesSymptomCode)	
		No	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.</p> <p>Verify that the issue is resolved.</p>	\$(nodeText.noSymptomCode)	
16.	<p>To troubleshoot this issue completely, a known-good fan is required.</p> <p>Do you have immediate access to a known-good fan?</p>	Yes	Go to step 17.	\$(nodeText.yesSymptomCode)	
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
17.	<p>Important: Ensure that user's computer is shut down, then remove the power cord and wait two minutes for self discharge to occur.</p> <p>Substitute a known-good fan and retest using MRI/diagnostics.</p> <p>Does diagnostics still report a fan error?</p>	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
18.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>Remove fan. Inspect fan and inner heat sink fin stack of CPU for obstructions. Clean and remove any obstructions or debris. Reinstall fan and retest with MRI/diagnostics. MRI thermal sensors begin with Txxx.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does diagnostics still report a thermal sensor error?</p>	Yes	Go to step 19.	\${nodeText.yesSymptomCode}	
		No	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.</p> <p>Verify that the issue is resolved.</p>	\${nodeText.noSymptomCode}	
19.	<p>LCD thermal sensor failure alone can cause an unexpected shutdown. It may also affect logic board thermal sensors that are connected in parallel on logic board.</p> <p>LCD thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u></p> <p>Temperature (TL0p) - LCD proximity</p> <p>Temperature (TL1p) - TCON proximity</p> <p>Does diagnostics report an LCD thermal sensor error (TL0p/TL1)?</p>	Yes	Go to step 20.	\${nodeText.yesSymptomCode}	
		No	Go to step 28.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
20.	The TL0p sensor is attached on back of the LCD panel, while the TL1p sensor is part of LCD logic board. Identify which one of these sensors report an error when running diagnostics. Does diagnostics report a TL0p or TL1p sensor error?	TL0p	Go to step 21.	\$_{nodeText.yesSymptomCode}	
		TL1p	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
21.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Inspect thermal sensor, cable, and connector, for damage. TL0p LCD thermal sensor is attached with tape to rear of LCD panel with glass with a short, thin cable. This sensor does not connect to logic board. It connects to a thermal sensor board mounted on LCD panel. LCD thermal sensor signals are encoded on this board (which is part of the LCD panel), and this information is sent to logic board through DisplayPort cable. Did you find any damaged components?	Yes	Go to step 27.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 22.	\$_{nodeText.noSymptomCode}	
22.	Reseat LCD thermal sensor cable to thermal sensor board mounted on LCD and reseat DisplayPort connector on logic board. Retest using diagnostics. CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in. Does diagnostics still report an LCD thermal sensor error (TL0p)?	Yes	Go to step 23.	\$_{nodeText.yesSymptomCode}	
		No	Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down. Verify that the issue is resolved.	\$_{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
23.	<p>To troubleshoot this issue completely, a known-good LCD thermal sensor cable is required.</p> <p>Note: LCD thermal sensor cable is available separately. A replacement LCD panel with glass also comes with a new LCD thermal sensor cable already attached.</p> <p>Do you have immediate access to a known-good LCD thermal sensor cable?</p>	Yes	Go to step 24.	`\${nodeText.yesSymptomCode}`	
		No	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE
24.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD thermal sensor cable and retest using diagnostics.</p> <p>Does diagnostics still report an LCD thermal sensor error (TL0p)?</p>	Yes	Go to step 25.	`\${nodeText.yesSymptomCode}`	
		No	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE
25.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Note: LCD thermal sensor cable is available separately. A replacement LCD panel with glass also comes with a new LCD thermal sensor cable already attached.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 26.	`\${nodeText.yesSymptomCode}`	
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
26.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass, and retest using diagnostics.</p> <p>Does diagnostics still report an LCD thermal sensor error (TL0p)?</p>	Yes	Replace logic board. Reinstall user's LCD thermal sensor cable. Verify issue resolved.	M23	MLB
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD

	Check	Result	Action	Code	Commodity
27.	<p>Identify whether LCD thermal sensor cable is the only damaged component. Damage to multiple parts will require an escalation to ACS.</p> <p>Is damaged limited to LCD thermal sensor cable only?</p>	Yes	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
28.	<p>Hard drive thermal sensor failure alone can cause an unexpected shutdown. It can also affect logic board thermal sensors that are connected in parallel on logic board.</p> <p>Hard drive thermal sensor names:</p> <p><u>Sensor - MRI Sensor Name</u> TH00 - Hard drive proximity TH0o - Hard drive Out of Band</p> <p>Does diagnostics report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 29.	\${nodeText.yesSymptomCode}	
		No	Go to step 36.	\${nodeText.noSymptomCode}	
29.	<p>Newer iMacs have a thermal sensor built-in to the hard drive. Third-party hard drives may not have this sensor present and should flag a TH0o error. If user's hard drive is third-party, you may wish to explain to user that repair should continue with a known-good Apple hard drive.</p> <p>Is a third-party hard drive installed?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Go to step 30.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
30.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>The thermal sensor internal to the hard drive is wired through hard drive data cable to logic board. Inspect hard drive data cable, hard drive connector, and logic board connector for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 35.	\${nodeText.yesSymptomCode}	
		No	Go to step 31.	\${nodeText.noSymptomCode}	
31.	<p>Reseat hard drive data cable to both hard drive and logic board, then retest using diagnostics.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Does diagnostics still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 32.	\${nodeText.yesSymptomCode}	
		No	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.</p> <p>Verify that the issue is resolved.</p>	\${nodeText.noSymptomCode}	
32.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive • Hard drive data cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 33.	\${nodeText.yesSymptomCode}	
		No	<p>Replace hard drive data cable. Verify issue resolved.</p>	X03	INTERNAL CABLE
33.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive data cable and retest using diagnostics.</p> <p>Does diagnostics still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 34.	\${nodeText.yesSymptomCode}	
		No	<p>Replace hard drive data cable. Verify issue resolved.</p>	X03	INTERNAL CABLE

	Check	Result	Action	Code	Commodity
34.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive and retest using diagnostics.</p> <p>Does diagnostics still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Replace logic board. Reinstall user's hard drive and hard drive data cable. Verify issue resolved.	M23	MLB
		No	Replace hard drive. Reinstall user's hard drive data cable. Verify issue resolved.	H85	HDD
35.	<p>Identify whether hard drive data cable is the only damaged component. Damage to multiple parts will require an escalation to ACS.</p> <p>Is damaged limited to hard drive data cable only?</p>	Yes	Replace hard drive data cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
36.	<p>iMacs with an SSD/flash storage card have a thermal sensor built-into the SSD/flash storage card.</p> <p>SSD/flash storage thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TH1R - SSD Out of band</p> <p>Does diagnostics report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Go to step 37.	\${nodeText.yesSymptomCode}	
		No	Go to step 42.	\${nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
37.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>The thermal sensor internal to the SSD/flash storage is wired through the data connection to the logic board. Inspect SSD/flash storage card data connector and logic board connector for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 41.	\$_{nodeText.yesSymptomCode}	
		No	Go to step 38.	\$_{nodeText.noSymptomCode}	
38.	<p>Reseat SSD/flash storage card to logic board, then retest using diagnostics.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Does diagnostics still report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Go to step 39.	\$_{nodeText.yesSymptomCode}	
		No	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.</p> <p>Verify that the issue is resolved.</p>	\$_{nodeText.noSymptomCode}	
39.	<p>To troubleshoot this issue completely, a known-good SSD/flash storage card is required.</p> <p>Do you have immediate access to a known-good SSD/flash storage card?</p>	Yes	Go to step 40.	\$_{nodeText.yesSymptomCode}	
		No	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD
40.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good SSD/flash storage card and retest using diagnostics.</p> <p>Does diagnostics still report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Replace logic board. Reinstall user's SSD/flash storage card. Verify issue resolved.	M23	MLB
		No	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD

	Check	Result	Action	Code	Commodity
41.	<p>Identify whether SSD/flash storage card connector is the only damaged component. Damage to multiple parts will require an escalation to ACS.</p> <p>Is damaged limited to SSD/flash storage card only?</p>	Yes	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
42.	<p>Ambient thermal sensor failure alone can cause an unexpected shutdown. This sensor monitors incoming airflow to properly cool CPU.</p> <p>Ambient thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TA0p - Ambient MLB</p> <p>Does diagnostics report an ambient thermal sensor error (TA0p)?</p>	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No	Go to step 43.	\$(nodeText.noSymptomCode)	
43.	<p>We have exhausted all external thermal sensors other than those on logic board.</p> <p>MRI thermal sensor names:</p> <p><u>Sensor - MRI Sensor Name</u> TCXr - CPU die TC0p - CPU Proximity TG0d - GPU die TG0p - GPU Proximity TPCD - PCH die TM0p - TM1P-TM2P- TM3p - SO-DIMM Proximity Tm0p - Tm1p-Tm2p - Misc. MLB Proximity Tb0p - BLC Proximity</p> <p>Does diagnostics report any of the above thermal sensors as failing?</p>	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No	Go to step 44.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
44.	<p>Power supply thermal sensor failures can cause an unexpected shutdown. This sensor monitors the power supply secondary heat sink temperature.</p> <p>Power supply thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TP2h - AC/DC Secondary heat sink</p> <p>Does diagnostics report an power supply thermal sensor error (TP2h)?</p>	Yes	Replace power supply. Verify issue resolved.	P02	MLB
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
45.	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not unexpectedly shut down.</p> <p>Verify that the issue is resolved.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Kernel Panic / System Crashes

Unlikely causes:

Battery, DisplayPort cable, HDD power cable, LCD panel with glass, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s)

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Computer displays a kernel panic alert message (see article PH21900: If your Mac restarts and a message appears)• Computer freezes during use• Computer freezes upon wake from sleep• Computer freezes when Wi-Fi is enabled or activated <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply latest software and firmware updates. Remember that third party software can contribute to this issue. It may be necessary to check for and apply third party updates that may not appear in the App store.2. Remove all external devices, except for a known-good USB keyboard and mouse, to help rule out peripherals as a possible cause of this issue.3. Verify memory configuration matches actual amount of installed physical memory.4. Hold Shift key during startup to put computer into Safe Mode. See article HT201262: Try safe mode if your Mac doesn't finish starting up.5. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: About OS X Recovery.6. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.7. Follow steps outlined in article HT200553: OS X: When your computer spontaneously restarts or displays "Your computer restarted because of a problem."8. If the issue cannot be easily reproduced, Run ASD or AST 2 extended memory tests, if available, repeatedly, to verify that the computer does not encounter a crash or kernel panic.9. If the iMac is internally equipped with both a hard disc drive (HDD) and a solid-state drive (SSD), refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. <p>CAUTION: Be extremely careful when working inside the computer when power is applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	A voltage, current, or thermal sensor failure or an inoperative fan can cause kernel panics or system crashes. Run Macintosh Resource Inspector (MRI) or consult MRI logs to check for any sensor or fan failures. Does MRI report any sensor or fan failures?	Yes	Go to “Intermittent Shutdown” troubleshooting flow.	\$(nodeText.yesSymptomCode)	
		No	Go to step 2.	\$(nodeText.noSymptomCode)	
2.	Reset SMC using the procedure for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac . Then reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. Does computer still experience crashes or kernel panics?	Yes	Go to step 3.	\$(nodeText.yesSymptomCode)	
		No	Issue resolved by SMC/PRAM reset. Verify resolution. This issue could reoccur if the cause is one of the user's external devices that was not brought in with the computer. Advise user to verify computer is functioning properly by initially leaving all external devices detached, then connecting them one at a time to confirm each device's functionality. If this issue reoccurs, the user should document which external devices are attached and bring them with the computer.	\$(nodeText.noSymptomCode)	
3.	Ask user which USB device(s) are used with computer when crashes or kernel panics occur. Does user have a USB device that may be causing crashes or kernel panics?	Yes	Go to step 4.	\$(nodeText.yesSymptomCode)	
		No	Go to step 5.	\$(nodeText.noSymptomCode)	
4.	Connect a known-good wired Apple aluminum USB keyboard and wired mouse to user's computer. Disconnect user's USB device(s). Test computer with OS or diagnostics. Does computer still experience crashes or kernel panics?	Yes	Go to step 5.	\$(nodeText.yesSymptomCode)	
		No	ESCALATION REQUIRED. Contact ACS for additional support and latest USB device information. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
5.	<p>Connect a known-good Apple wired keyboard and Apple wired mouse to user's computer.</p> <p>Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition.</p> <p>If the iMac is internally equipped with both an HDD and SSD/flash storage, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 6.	\$(nodeText.yesSymptomCode)	
		No	Go to step 28.	\$(nodeText.noSymptomCode)	
6.	<p>Hold Shift key during startup to put computer into Safe Mode. See article HT201262: Try safe mode if your Mac doesn't finish starting up.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 7.	\$(nodeText.yesSymptomCode)	
		No	Go to step 11.	\$(nodeText.noSymptomCode)	
7.	<p>On some models the memory is non-serviceable and can not be removed from the MLB.</p> <p>Is the memory removable from the system?</p>	Yes	Go to step 9.	\$(nodeText.yesSymptomCode)	
		No	Go to step 8.	\$(nodeText.noSymptomCode)	
8.	<p>Check to see if diagnostic LED #3 is illuminated.</p> <p>Note: Depending on computer model, this may simply require looking through the bottom air flow opening or removing the LCD.</p> <p>Is diagnostic LED #3 illuminated?</p>	Yes	Go to step 11.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M06	MLB

	Check	Result	Action	Code	Commodity
9.	<p>Remove installed memory modules and substitute one by one with a known-good memory module.</p> <p>Note: Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 10.	\$(nodeText.yesSymptomCode)	
		No	<p>Isolate and replace memory module.</p> <p>Note: Only replace a defective memory module. There is no need to replace memory in pairs.</p> <p>Verify issue resolved.</p>	X01	MEMORY
10.	<p>Check logic board memory slots one by one, using a known-good memory module, to isolate a slot-related failure and retest.</p> <p>Note: Connecting an external display will permit retesting without reinstalling the internal LCD panel.</p> <p>Does crash or kernel panic occur when memory is installed in a specific slot?</p>	Yes	<p>Replace logic board.</p> <p>Reinstall user's memory.</p> <p>Verify issue resolved.</p>	M06	MLB
		No	Go to step 11.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
11.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove wireless card and retest by testing computer with OS or diagnostics. Connect power cord to computer, wait five seconds for SMC to reset, then press power button.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 17.	\$(nodeText.yesSymptomCode)	
		No	Go to step 12.	\$(nodeText.noSymptomCode)	
12.	<p>Inspect wireless card and logic board connectors for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 16.	\$(nodeText.yesSymptomCode)	
		No	Go to step 13.	\$(nodeText.noSymptomCode)	
13.	<p>Reseat wireless card to logic board and retest with OS or diagnostics.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 14.	\$(nodeText.yesSymptomCode)	
		No	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not encounter a crash or kernel panic</p> <p>Verify that the issue is resolved.</p>	\$(nodeText.noSymptomCode)	
14.	<p>To troubleshoot this issue completely, a known-good wireless card is required.</p> <p>Do you have immediate access to a known-good wireless card?</p>	Yes	Go to step 15.	\$(nodeText.yesSymptomCode)	
		No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
15.	Substitute a known-good wireless card and retest computer with OS or diagnostics.	Yes	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M06	MLB
	Does computer still experience crashes or kernel panics?	No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
16.	Identify whether wireless card is the only damaged component. Damage to multiple parts will require an escalation to ACS. Is damaged limited to wireless card only?	Yes	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	
17.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Disconnect camera/microphone/ALS cable from either logic board or camera and retest computer with OS or diagnostics. Does computer still experience crashes or kernel panics?	Yes	Go to step 25.	\$(nodeText.yesSymptomCode)	
		No	Go to step 18.	\$(nodeText.noSymptomCode)	
18.	Inspect camera, camera/microphone/ALS cable, and logic board connector for damage. Did you find any damaged components?	Yes	Go to step 24.	\$(nodeText.yesSymptomCode)	
		No	Go to step 19.	\$(nodeText.noSymptomCode)	
19.	Reseat both ends of camera/microphone/ALS cable and retest computer with OS or diagnostics. Does computer still experience crashes or kernel panics?	Yes	Go to step 20.	\$(nodeText.yesSymptomCode)	
		No	Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not encounter a crash or kernel panic Verify that the issue is resolved.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
20.	To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required. Do you have immediate access to a known-good camera/microphone/ALS cable?	Yes	Go to step 21.	\$(nodeText.yesSymptomCode)	
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
21.	Substitute a known-good camera/microphone/ALS cable and retest computer with OS or diagnostics. Does computer still experience crashes or kernel panics?	Yes	Go to step 22.	\$(nodeText.yesSymptomCode)	
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
22.	To troubleshoot this issue completely, a known-good camera is required. Do you have immediate access to a known-good camera?	Yes	Go to step 23.	\$(nodeText.yesSymptomCode)	
		No	Replace camera. Reinstall user's camera/microphone/ALS cable. Verify issue resolved.	X11	OTHER ELECTRIC
23.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good camera and retest computer with OS or diagnostics. Does computer still experience crashes or kernel panics?	Yes	Replace logic board. Reinstall user's camera and camera/microphone/ALS cable. Verify issue resolved.	M06	MLB
		No	Replace camera. Reinstall user's camera/microphone/ALS cable. Verify issue resolved.	X11	OTHER ELECTRIC
24.	Identify whether camera/microphone/ALS cable is the only damaged component. Damage to multiple parts will require an escalation to ACS. Is damaged limited to camera/microphone/ALS cable only?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
25.	Mac models may have a hard drive, SSD/flash storage, or both. If the iMac is internally equipped with both, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.	Yes	Go to step 36.	\$(nodeText.yesSymptomCode)	
	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Disconnect hard drive data cable (or SSD/flash storage) from logic board. Connect an Ethernet cable and power cord to computer, wait five seconds for SMC to reset, then press power button. Hold down Command-Option-R keys during startup to force restart from OS X Internet recovery.</p> <p>This process may take a few minutes for computer to completely start up, depending on speed of your Internet connection. See article HT201314: About OS X Recovery for more information.</p> <p>Does computer still experience crashes or kernel panics?</p>	No	Go to step 26.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
26.	<p>Mac models may have a hard drive, SSD/flash storage, or both. If the iMac is internally equipped with both, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. To support Fusion Drive functionality, a known-good HDD and SSD/flash storage should be used.</p> <p>To completely troubleshoot this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive or SSD/flash storage • Hard drive data cable <p>For a Fusion Drive computer, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive and paired SSD/flash storage • Hard drive data cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 30.	\$(nodeText.yesSymptomCode)	
		No	Go to step 27.	\$(nodeText.noSymptomCode)	
27.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reconnect hard drive data cable (or SSD/flash storage) to logic board.</p> <p>Hold down Command-R during startup to restart from the recovery partition and use Disk Utility to repair user's hard drive or SSD/flash storage. If disk repair is successful, restart and test user's OS.</p> <p>Was Disk Utility repair successful and is crash/kernel panic issue resolved?</p>	Yes	Issue resolved after Disk Utility repair. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 28.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
28.	Restore OS X on user's hard drive or SSD/flash storage. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Does computer still experience crashes or kernel panics?	Yes	Go to step 29.	\$(nodeText.yesSymptomCode)	
		No	Issue resolved after reinstalling OS X. Verify resolution.	\$(nodeText.noSymptomCode)	
29.	Identify the type of storage device affected: <ul style="list-style-type: none">• Hard disk drive (HDD)• Flash storage / solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's SSD/flash storage. Verify issue resolved.	H02	SSD
30.	iMacs equipped with both a hard disk drive (HDD) and solid-state drive (SSD) / flash storage ship as a Fusion Drive configuration. Refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. Is computer configured as a Fusion Drive?	Yes	Go to step 35.	\$(nodeText.yesSymptomCode)	
		No	Go to step 31.	\$(nodeText.noSymptomCode)	
31.	iMac may be equipped with either a hard drive or SSD/flash storage. Identify which type of storage device is installed. Is computer equipped with a hard drive or with a SSD/flash storage card?	Hard Drive	Go to step 33.	\$(nodeText.yesSymptomCode)	
		SSD/Flash Storage	Go to step 32.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
32.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute known-good SSD/flash storage with an up-to-date, bootable version of OS X installed. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Replace logic board. Reinstall user's SSD/flash storage. Verify issue resolved.	M06	MLB
		No	Replace user's SSD/flash storage. Verify issue resolved.	H02	SSD
33.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive with an up-to-date, bootable version of OS X installed. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 34.	\${nodeText.yesSymptomCode}	
		No	Replace user's hard drive. Verify issue resolved.	H02	HDD
34.	<p>Continue using known-good hard drive. Substitute a known-good hard drive data cable between drive and logic board, and retest computer with OS.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Replace logic board. Reinstall user's hard drive (or/and SSD/flash storage) and data cable. Verify issue resolved.	M06	MLB
		No	Replace hard drive data cable. Reinstall user's hard drive. Verify issue resolved.	X03	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
35.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive and SSD/flash storage paired as a Fusion Drive with an up-to-date, bootable version of OS X installed. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 34.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
36.	<p>Restart computer from Apple Service Toolkit (AST) server by pressing N key on startup.</p> <p>Use extended version of Cooling System Diagnostics (CSD) to verify proper function of the following subsystems:</p> <ul style="list-style-type: none"> • SMC • Fan • Thermal sensors • CPU–heat sink thermal interface <p>Does computer pass all CSD checks?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Go to step 37.	\$(nodeText.noSymptomCode)	
37.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Inspect fan and heat sink fin stack. Partial disassembly of computer is required to access fan and heat sink. Use an ESD-safe vacuum to remove any dust or debris. Reassemble and retest using CSD.</p> <p>Does computer pass all CSD checks?</p>	Yes	Issue resolved by cleaning airflow. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 38.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
38.	To troubleshoot this issue completely, a known-good fan is required. Do you have immediate access to known-good fan?	Yes	Go to step 39.	\${nodeText.yesSymptomCode}	
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
39.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good fan and retest using CSD. Does computer now pass CSD tests?	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 40.	\${nodeText.noSymptomCode}	
40.	To troubleshoot this issue completely, a known-good logic board is required. Do you have immediate access to a known-good logic board?	Yes	Go to step 41.	\${nodeText.yesSymptomCode}	
		No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
41.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Continue to use known-good fan. Substitute a known-good logic board. Reassemble computer and retest with MRI and CSD. Do both known-good fan and logic board pass MRI and CSD tests?	Yes	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
42.	<p>Run ASD or AST 2 extended memory tests, if available, repeatedly to verify that the computer does not encounter a crash or kernel panic</p> <p>Verify that the issue is resolved.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

No Power

Unlikely causes:

Camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, right speaker, solid-state drive (SSD)/Flash storage card, stand, Wi-Fi/Bluetooth antenna(s)

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Computer does not turn on• Computer does not turn off• No image on internal or external displays• No startup sound• No sounds from fan or hard drive (if hard drive present)• No Caps Lock LED when key is pressed on wired keyboard• Non-operational <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify AC power source.2. Disconnect all peripherals.3. Verify user's power cord.4. Determine whether computer is in power-on state by checking for all of the following:<ul style="list-style-type: none">◦ Caps Lock LED on wired keyboard◦ Fan spinning sound◦ Startup sound◦ Hard drive spin (if hard drive present)◦ Display backlight on◦ External display activity◦ Thunderbolt disk mode operation5. Reset SMC using the procedure listed in article HT201295: Resetting the System Management Controller (SMC) on your Mac. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none">• TP833: iMac and Displays: Power Supply Cover Instructions• TP820: iMac (27-inch): Safety• TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	The user may report that the computer will not turn off or the computer will not turn on (no power). Which issue is the user experiencing?	Will Not Turn Off	Go to step 22.	`\${nodeText.yesSymptomCode}`	
		No Power	Go to step 2.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
2.	Press power button to start up computer. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard. Does computer show any signs of power activity?	Yes	Go to step 16.	\${nodeText.yesSymptomCode}	
		No	Go to step 3.	\${nodeText.noSymptomCode}	
3.	Inspect user's power cord for wire or connector damage. Also inspect computer AC inlet for signs of arcing or damaged pins, which could affect power cord connections. Did you find any damaged components?	Yes	Go to step 4.	\${nodeText.yesSymptomCode}	
		No	Go to step 5.	\${nodeText.noSymptomCode}	
4.	Determine whether damage affects user's power cord, AC inlet, or both. Is damage limited to power cord only?	Yes	Replace user's power cord. Verify issue resolved.	X03	EXTERNAL CABLE
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair.	X99	
5.	Verify that user's power cord is securely plugged into a known-good, grounded electrical outlet that provides adequate voltage and power to operate computer. Ensure power cord is fully seated to AC inlet. Attempt to turn on computer. Does issue persist with known-good power cord?	Yes	Go to step 6.	\${nodeText.yesSymptomCode}	
		No	Go to step 16.	\${nodeText.noSymptomCode}	
6.	Substitute a known-good power cord and attempt to turn on computer. Does issue persist with known-good power cord?	Yes	Go to step 7.	\${nodeText.yesSymptomCode}	
		No	Replace user's power cord. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
7.	Reset SMC using the procedure listed for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac . 1. Press and hold power button a little more than 10 seconds to force SMC to turn off computer from an unknown power state. 2. Disconnect power cord and wait 15 seconds with power cord removed to reset SMC. 3. Attach computer's power cord, making sure power button is not being pressed. 4. Wait five seconds, then press power button to turn on computer. Does issue persist after SMC reset?	Yes	Go to step 8.	\$(nodeText.yesSymptomCode)	
		No	Issue resolved after SMC reset. Verify resolution.	\$(nodeText.noSymptomCode)	
8.	Remove AC power cord and allow time for power supply to discharge before opening computer for repair. Remove glass and LCD panel to inspect and reseal: <ul style="list-style-type: none"> AC inlet power to power supply DC power cable between power supply and logic board Power button cable to power supply Inspect wires and connectors, looking for pinched or exposed wire, and burnt or damaged connectors and pins. Did you find any damaged components?	Yes	Go to step 9.	\$(nodeText.yesSymptomCode)	
		No	Go to step 10.	\$(nodeText.noSymptomCode)	
9.	Determine whether damage affects DC power cable only, or additional components such as power supply or logic board connectors. Multiple damaged parts requiring replacement will be escalated to ACS. Is damage limited to DC power cable only?	Yes	Replace power supply. Verify issue resolved.	P16	POWER SUPPLY
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair.	P99	

	Check	Result	Action	Code	Commodity
10.	<p>Connect power cord to computer, wait five seconds for SMC to set, then press power button. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does computer show any signs of power activity?</p>	Yes	Go to step 15.	\$(nodeText.yesSymptomCode)	
		No	Go to step 11.	\$(nodeText.noSymptomCode)	
11.	<p>Disconnect the wireless card from the logic board.</p> <p>Attempt normal startup.</p> <p>Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.</p> <p>Does computer show any signs of power activity?</p>	Yes	Replace wireless card. Verify issue resolved.	N01	WIRELESS DEVICE
		No	Go to step 12.	\$(nodeText.noSymptomCode)	
12.	<p>Locate diagnostic LEDs on logic board. With AC power cord connected to computer, verify whether diagnostic LED #1 is on, indicating power supply is providing power to SMC and logic board.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Is diagnostic LED #1 on?</p>	Yes	Go to step 13.	\$(nodeText.yesSymptomCode)	
		No	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY

	Check	Result	Action	Code	Commodity
13.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Disconnect power button cable from power supply to inspect cable and connector for damage. Using a multimeter set as ohm meter, verify continuity between the two pins of the power button when it is pressed. A properly working power button should be open when button is released.</p> <p>For additional information on using a multimeter, see article HT3250: Using a digital multimeter.</p> <p>Does power button have continuity when button is pressed and open when released?</p>	Yes	Go to step 14.	\$(nodeText.yesSymptomCode)	
		No	<p>ESCALATION REQUIRED.</p> <p>Replace the rear housing which includes the power button. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact ACS for additional support regarding warranty coverage for this part.</p>	X99	
14.	<p>Reconnect power button cable to power supply. Connect power cord to computer, wait five seconds for SMC to set, then press power button to start up computer. Verify whether diagnostic LED #2 is on soon after power button is pressed. This indicates that power to start up computer is on.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Are both diagnostic LED #1 and LED #2 on?</p>	Yes	Go to step 15.	\$(nodeText.yesSymptomCode)	
		No	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY
15.	<p>Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.</p> <p>Does computer show any signs of power activity?</p>	Yes	Go to step 16.	\$(nodeText.yesSymptomCode)	
		No	Go to step 18.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
16.	Verify whether a video signal appears on display.	Yes	Run Mac Resource Inspector (MRI) to obtain latest test results. Verify issue resolved.	\$(nodeText.yesSymptomCode}	
	Is a video image clearly visible on display?	No	Go to step 17.	\$(nodeText.noSymptomCode}	
17.	On a display with dim or no backlight, shine a bright flashlight onto front of display while carefully checking for a faint image showing graphics, an Apple logo, open windows, or other signs that the system is partially functional.	Yes	Go to “Backlight Issue / No Backlight” troubleshooting flow.	\$(nodeText.yesSymptomCode}	
	Is any video visible with flashlight?	No	Go to “Power But Blank/No Video” troubleshooting flow.	\$(nodeText.noSymptomCode}	
18.	To continue to troubleshoot this issue, a known-good power supply is required.	Yes	Go to step 19.	\$(nodeText.yesSymptomCode}	
	Do you have immediate access to a known-good power supply?	No	Go to step 20.	\$(nodeText.noSymptomCode}	
19.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.	Yes	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY
	Substitute a known-good power supply and attempt to turn on computer.	No	Go to step 20.	\$(nodeText.noSymptomCode}	
20.	Does computer show any signs of power activity?				
	Measure the logic board coin battery voltage using one of the procedures listed below: <ul style="list-style-type: none"> • TP911: iMac (21.5-inch): Diagnostic LEDs and Test Pads • TP813: iMac (27-inch): Diagnostic LEDs and Test Pads Carefully touch one multimeter probe to each pad to measure an expected coin battery voltage of 3 volts DC. If the voltage is 2.7 VDC or less, replace the coin battery. For additional information on using a multimeter, see article HT3250: Using a digital multimeter . Is the coin battery voltage low (2.7 VDC or less)?	Yes	Replace coin battery. Verify issue resolved.	P12	OTHER ELECTRIC
		No	Go to step 21.	\$(nodeText.noSymptomCode}	

21.	<p>Important: Remove AC power to computer and wait two minutes.</p> <p>Force-reset the logic board Real-Time Clock (RTC) using one of the procedures listed below, and refer to corresponding link for exact location of reset pads for this computer. Be extra careful not to touch any other components to avoid damaging logic board.</p> <p>Caution: Do not short-circuit the reset pads for more than a few seconds, as doing so may cause damage to coin battery and/or logic board.</p> <ol style="list-style-type: none"> 1. Small flat-blade screwdriver: Gently touch flat edge of the tip of the blade to both pads simultaneously. 2. Torx T-10 screwdriver: Holding screwdriver vertically, bridge the flat surface of the tip across both reset pads. 3. Two small metal jeweler's screwdrivers: Touch the tip of each screwdriver to each reset pad, then cross the shanks of the two screwdrivers and touch them together briefly. <ul style="list-style-type: none"> ◦ TP911: iMac (21.5-inch): Diagnostic LEDs and Test Pads ◦ TP813: iMac (27-inch): Diagnostic LEDs and Test Pads <p>Connect power cord to computer, wait five seconds for SMC to set, then press power button. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p>	Yes	Issue resolved by resetting logic board. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Replace logic board. Verify issue resolved.	M01	MLB

	<p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does computer show any signs of power activity?</p>				
22.	<p>If any app hangs or freezes when the computer is shutting down, then try to force quit that app. Also check if any software updates are in progress.</p> <p>Does the computer turn off?</p>	Yes	Issue resolved. Verify resolution.	\$(nodeText.yesSymptomCode)	
		No	Go to step 23.	\$(nodeText.noSymptomCode)	
23.	<p>Press and hold down the power button for 10 seconds or until user's computer powers off.</p> <p>Does the computer turn off?</p>	Yes	Go to step 24.	\$(nodeText.yesSymptomCode)	
		No	Go to step 25.	\$(nodeText.noSymptomCode)	
24.	<p>Reset SMC using the procedure listed for this computer in article HT201295: Resetting the System Management Controller (SMC) on your Mac.</p> <ol style="list-style-type: none"> 1. Press and hold power button a little more than 10 seconds to force SMC to turn off computer from an unknown power state. 2. Disconnect power cord and wait 15 seconds with power cord removed to reset SMC. 3. Attach computer's power cord, making sure power button is not being pressed. 4. Wait five seconds, then press power button to turn on computer. <p>Does issue persist after SMC reset?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p>	\$(nodeText.yesSymptomCode)	
		No	Issue resolved after SMC reset. Verify resolution.	\$(nodeText.noSymptomCode)	

	Check	Result	Action	Code	Commodity
25.	Remove AC power cord and allow time for power supply to discharge before opening computer for repair.	Yes	Go to step 26.	\${nodeText.yesSymptomCode}	
	Remove glass and LCD panel to inspect and reseal:				
	<ul style="list-style-type: none"> AC inlet power to power supply DC power cable between power supply and logic board Power button cable to power supply 	No	Go to step 27.	\${nodeText.noSymptomCode}	
	Inspect wires and connectors, looking for pinched or exposed wire, and burnt or damaged connectors and pins.				
26.	Did you find any damaged components?				
	Determine whether damage affects power button cable only from main logic board to rear housing, or additional components such as power supply or logic board connectors. Multiple damaged parts requiring replacement will be escalated to ACS.	Yes	Replace rear housing. Verify issue resolved.	X03	ENCLOSURE
		No	ESCALATION REQUIRED.	P99	
	Is damage limited to power button cable only?		Contact ACS for additional support or a multiple-part repair.		

	Check	Result	Action	Code	Commodity
27.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Disconnect power button cable from power supply to inspect cable and connector for damage. Using a multimeter set to read ohms, verify continuity between the two pins of the power button when it is pressed. A properly working power button should be open when button is released.</p> <p>For additional information on using a multimeter, see article HT3250: Using a digital multimeter.</p> <p>Does power button have continuity when button is pressed and open when released?</p>	Yes	No failure found during diagnostic testing. Using correct positioning, return computer to user with no trouble found. Verify issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	Replace rear housing. Verify issue resolved.	X14	ENCLOSURE
28.	<p>Verify that computer can now complete startup process over multiple trials.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.	`\${nodeText.yesSymptomCode}`	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p>	X99	

Will Not Start Up

Unlikely causes:

Camera, camera/microphone/ALS cable, fan, DisplayPort cable, left speaker, power supply, rear enclosure, right speaker, stand

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> No startup sound or POST (Power-On Self-Test) Gray screen appears during startup Some video activity, Apple logo, spinning gear Prohibitory sign or folder with a flashing question mark Startup chime or error beep tones Audible fan, hard drive spin (if present), or optical drive reset sounds Caps Lock LED on wired keyboard toggles on and off when pressed <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> Verify that startup process passes initial memory checks and POST (Power-On Self-Test) with a normal startup sound and with some video activity. If computer generates beeping sounds, there may be an issue with memory. See article HT201702: Intel-based Mac Power-On Self-Test RAM error codes. Disconnect all external peripherals and Ethernet cables. Reset SMC using the procedure listed for this computer in article HT201295: Intel-based Macs: Resetting the System Management Controller (SMC) to return computer to a known power-off state. Try to power on from power-off state. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. Refer to article HT204063: How to Reset NVRAM on your Mac for more information. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery. Run Disk Utility or check Mac Resource Inspector (MRI) results to verify presence and SMART status of user's hard drive (HDD) or solid-state drive (SSD)/flash storage card. iMac models may have a hard drive or SSD/flash storage card, or both. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model. Hold Shift key during startup to put computer into Safe Mode. See article HT201262: Try safe mode if your Mac doesn't finish starting up. Identify when during startup process computer hangs in order to isolate the issue. See article HT204156: About the screens you see when your Mac starts up. If the iMac is internally equipped with both a hard disc drive (HDD) and a solid-state drive (SSD)/flash storage card, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system energized. Avoid touching the logic board or power supply while the computer is plugged in. Always cover the power supply and logic board with power supply covers to protect yourself when working inside the computer.</p> <p>Before removing any components, be sure to turn off computer, and unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> TP833: iMac and Displays: Power Supply Cover Instructions TP820: iMac (27-inch): Safety TP914: iMac (21.5-inch): Safety

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. A memory error is indicated by a sequence of one or three beep tones. Refer to article HT201702: Intel-based Mac Power-On Self-Test RAM error codes for more information.	Yes	Go to step 2.	\${nodeText.yesSymptomCode}	
		No	Go to step 17.	\${nodeText.noSymptomCode}	
	Does computer make error beep tones at startup?				
2.	Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. A memory error is indicated by a sequence of one or three beep tones. Refer to article HT201702: Intel-based Mac Power-On Self-Test RAM error codes for more information.	Yes	Go to step 3.	\${nodeText.yesSymptomCode}	
		No	Go to step 18.	\${nodeText.noSymptomCode}	
	Does computer make error beep tones at startup?				
3.	Reseat all memory modules securely in their slots and retest.	Yes	Go to step 4.	\${nodeText.yesSymptomCode}	
		No	Issue resolved. Verify resolution.	\${nodeText.noSymptomCode}	
	Does computer make error beep tones at startup?				
4.	iMac (27-inch, Late 2012 to Late 2015) computer models have four memory slots and may have up to four memory modules to test.	Yes	Go to step 8.	\${nodeText.yesSymptomCode}	
		No	Go to step 5.	\${nodeText.noSymptomCode}	
	Does this computer have four memory slots?				

	Check	Result	Action	Code	Commodity
5.	Turn off computer. Unplug computer from AC mains by disconnecting both ends of its power cord. Ensure computer is completely disconnected from AC mains before proceeding.	Yes	Go to step 6.	`\${nodeText.yesSymptomCode}`	
	<p>Remove LCD panel with glass.</p> <p>Remove logic board to access memory slots. Remove user's memory module from the first slot and substitute a known-good memory module into same slot. Reinstall logic board and LCD display (without VHB foam layers) and retest.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does computer indicate a memory error with one known-good module and one user module?</p>	No	<p>Replace defective memory.</p> <p>Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple.</p> <p>Verify issue resolved.</p>	X02	MEMORY
6.	Keep known-good memory module in the first slot and substitute second slot module with a second known-good memory module. Retest.	Yes	Replace logic board. Verify issue resolved.	M07	MLB
	Does computer indicate a memory error using two known-good memory modules?	No	Go to step 7.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
7.	Install first user memory module in first memory slot and test with a known-good memory module in second slot.	Yes	Replace both memory modules. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
	Does computer indicate a memory error?	No	Replace defective memory. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
8.	Typical configurations ship with two memory modules located in first two slots. It is possible to see a configuration with four memory modules installed.	Yes	Go to step 9.	`\${nodeText.yesSymptomCode}`	
	Is user's computer configured with four memory modules installed?	No	Go to step 14.	`\${nodeText.noSymptomCode}`	
9.	Keep track of where memory is located as you work in pairs to isolate memory and later verify slot functionality. Remove user memory from second two slots and retest.	Yes	Go to step 14.	`\${nodeText.yesSymptomCode}`	
	Does computer indicate a memory error with user memory in first two slots only?	No	Go to step 10.	`\${nodeText.noSymptomCode}`	
10.	Leave user memory installed in first two slots. Install two known-good memory modules in second two slots and retest.	Yes	Replace logic board. Verify issue resolved.	M07	MLB
	Does computer indicate a memory error with known-good memory in second two slots?	No	Go to step 11.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
11.	<p>Leave the two installed known-good memory modules in second two slots. Remove user memory from first two slots and set aside as proven good user memory. Install user memory originally removed from second two slots and place this memory into proven good first two slots. Retest.</p> <p>Does computer indicate a memory error with user memory in first two slots?</p>	Yes	Go to step 13.	#{nodeText.yesSymptomCode}	
		No	Go to step 12.	#{nodeText.noSymptomCode}	
12.	<p>Remove known-good memory from second two slots, leaving user memory (originally from second two slots) in first two slots. Install previously proven good user memory (originally from first two slots) into second two slots. Restart computer to verify user memory that has been reversed from original first two and second two slot configuration.</p> <p>Does computer indicate a memory error with user memory?</p>	Yes	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support. Situation - user memory passes test when paired with known-good memory but fails when paired with like user memory.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Issue resolved with memory reconfiguration, memory/slot reseal. Verify resolution.	#{nodeText.noSymptomCode}	

	Check	Result	Action	Code	Commodity
13.	<p>Remove known-good memory from second two slots, leaving user memory in first two slots. Restart computer to verify user memory in first two slots as standalone with no memory in second two slots.</p> <p>Does computer indicate a memory error with user memory in first two slots only?</p>	Yes	Go to step 14.	`\${nodeText.yesSymptomCode}`	
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support. Situation - user memory (currently located first two slots) fails when paired with known-good memory and passes when known-good memory is removed from adjacent slots.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
14.	<p>Remove user memory module from first slot and substitute a known-good memory module into same first slot. Retest.</p> <p>Does computer indicate a memory error with one known-good and one user module in first two slots?</p>	Yes	Go to step 15.	`\${nodeText.yesSymptomCode}`	
		No	<p>Replace defective memory.</p> <p>Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple.</p> <p>Verify issue resolved.</p>	X02	MEMORY
15.	<p>Keep known-good memory module in first slot and substitute second slot module with a second known-good memory module. Keep track of suspect user memory removed from second slot. Testing both first two slots with known-good memory will verify error is either defective slots or defective memory.</p> <p>Does computer indicate a memory error using two known-good memory modules in first two slots?</p>	Yes	Replace logic board. Verify issue resolved.	M07	MLB
		No	Go to step 16.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
16.	Install first user memory module (removed from first slot) into second memory slot and test paired with a known-good memory module still in first slot.	Yes	Replace both user memory modules in first two slots. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
	Does computer indicate a memory error?	No	Replace defective memory. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
17.	Check to see if diagnostic LED #3 is illuminated.	Yes	Go to step 18.	`\${nodeText.yesSymptomCode}`	
	Note: Depending on computer model, this may require either simply looking through the bottom air flow opening or removing the LCD display. Is the diagnostic LED #3 illuminated?	No	Replace logic board. Verify issue resolved.	M06	MLB
18.	Observe startup process to verify computer gets to initial gray screen after startup sound.	Yes	Go to step 19.	`\${nodeText.yesSymptomCode}`	
	Does computer reach a gray screen during startup process?	No	Go to "Power But Blank/No Video" troubleshooting flow.	`\${nodeText.noSymptomCode}`	
19.	Verify that computer completes full startup process: Startup sound > gray screen > Apple logo > spinning gear > login screen > user's desktop.	Yes	Issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
	Does computer complete startup process to user's desktop?	No	Go to step 20.	`\${nodeText.noSymptomCode}`	
20.	Start up computer and determine whether a kernel panic is occurring. Refer to article PH18791: If your Mac restarts and a message appears .	Yes	Go to "Kernel Panic/System Crashes" troubleshooting flow.	`\${nodeText.yesSymptomCode}`	
	Does computer display a kernel panic during startup?	No	Go to step 21.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
21.	Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery . Does computer start up from recovery partition?	Yes	Go to step 22.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 25.	`\${nodeText.noSymptomCode}`	
22.	Use a Fusion Drive-capable version of Disk Utility, Mac Resource Inspector (MRI), AST Storage Diagnostic, or Apple Service Diagnostic (ASD) to determine whether the user's HDD/SSD/flash storage is recognized, and SMART status is verified. Is user's HDD/SSD/flash storage detected and SMART status verified?	Yes	Go to step 23.	`\${nodeText.yesSymptomCode}`	
		No	Go to "HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read/Write Issues" troubleshooting flow.	`\${nodeText.noSymptomCode}`	
23.	If the iMac is internally equipped with both an HDD and SSD/flash storage, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. Check article HT204319: OS X versions and builds included with Mac computers and use Disk Utility or MRI to determine if the user's HDD/SSD/flash storage has the correct system build for this computer model. Is correct version/build of OS X installed on user's hard drive/SSD/flash storage?	Yes	Go to step 24.	`\${nodeText.yesSymptomCode}`	
		No	Restore correct version and build of OS X according to article HT204319: OS X versions and builds included with Mac computers . Verify issue resolved.	`\${nodeText.noSymptomCode}`	
24.	Run Disk Utility from the recovery partition to repair the user's HDD/SSD/flash storage. Attempt to start up from the user's HDD/SSD/flash storage. Does computer start up successfully from user's HDD/SSD/flash storage?	Yes	Issue resolved. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Restore correct version and build of OS X according to article HT204319: OS X versions and builds included with Mac computers . Verify issue resolved.	`\${nodeText.noSymptomCode}`	

	Check	Result	Action	Code	Commodity
25.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>Disconnect hard drive power and data cables at the hard drive. Remove SSD/flash storage card, if present. In order to verify the startup process with the LCD panel removed, connect an external display.</p> <p>Connect power cord to computer, wait five seconds for SMC to reset, then press power button. Hold down Command-Option-R keys during startup to force restart from OS X Internet Recovery over NetBoot. See article HT201314: OS X: About OS X Recovery.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips, refer to articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch): Safety • TP914: iMac (21.5-inch): Safety <p>Does computer start up from OS X Internet Recovery?</p>	Yes	Go to step 26.	<code>\${nodeText.yesSymptomCode}</code>	
		No	Go to step 38.	<code>\${nodeText.noSymptomCode}</code>	
26.	<p>To troubleshoot this issue completely, a known-good HDD or SSD/flash storage (depending on computer configuration) is required.</p> <p>Do you have immediate access to a known-good HDD/SSD/flash storage?</p>	Yes	Go to step 27.	<code>\${nodeText.yesSymptomCode}</code>	
		No	Go to step 30.	<code>\${nodeText.noSymptomCode}</code>	
27.	<p>Substitute known-good HDD/SSD/flash storage. Check article HT204319: OS X versions and builds included with Mac computers to make sure system build is correct for this computer model.</p> <p>Does computer start up with known-good HDD/SSD/flash storage?</p>	Yes	Go to step 28.	<code>\${nodeText.yesSymptomCode}</code>	
		No	Go to step 30.	<code>\${nodeText.noSymptomCode}</code>	

	Check	Result	Action	Code	Commodity
28.	<p>If the iMac is internally equipped with both a hard disc drive (HDD) and a solid-state drive (SSD) / flash storage, refer to article HT202574: Mac mini (Late 2012 and later), iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.</p> <p>Is user's computer configured with a Fusion Drive?</p>	Yes	Go to step 30.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 29.	`\${nodeText.noSymptomCode}`	
29.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid-state drive (SSD) <p>Is the affected device an HDD or SSD?</p>	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage/SSD. Verify issue resolved.	H02	SSD
30.	<p>Reseat and inspect hard drive power cable. Look for damaged wires, and pin or connector housing damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 32.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 31.	`\${nodeText.noSymptomCode}`	
31.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid-state drive (SSD) <p>Is the affected device an HDD or SSD?</p>	HDD	Go to step 33.	`\${nodeText.yesSymptomCode}`	
		SSD	Go to step 36.	`\${nodeText.noSymptomCode}`	
32.	<p>Multiple-component damage requires an escalation to ACS for multipart replacement.</p> <p>Is damage limited to hard drive power cable only?</p>	Yes	Replace hard drive power cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
		No	<p>ESCALATION REQUIRED.</p> <p>Contact ACS for additional support or a multiple-part repair.</p> <p>Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
33.	With hard drive power cable reseated, power on computer and verify hard drive disc spin-up, listening to disk spindle motor as it spins above 5000 RPMs. Does hard drive seem to be spinning as expected?	Yes	Go to step 34.	\$_{nodeText.yesSymptomCode}	
		No	Replace hard drive power cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
34.	To troubleshoot this issue completely, a known-good hard drive data cable is required. Do you have immediate access to a known-good hard drive data cable?	Yes	Go to step 35.	\$_{nodeText.yesSymptomCode}	
		No	Replace the user's hard drive. Verify issue resolved.	H02	HDD
35.	Substitute a known-good hard drive data cable and retest. Does computer start up with known-good hard drive data cable?	Yes	Replace hard drive data cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 36.	\$_{nodeText.noSymptomCode}	
36.	At this point in the troubleshooting process, you may be using the user's HDD/SSD/flash storage or a known-good HDD/SSD/flash storage. Which storage device type is currently installed?	User's HDD/SSD/flash storage	Go to step 37.	\$_{nodeText.yesSymptomCode}	
		Known-Good HDD/SSD/flash storage	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	
37.	Identify the type of storage device affected: <ul style="list-style-type: none">• Hard disk drive (HDD)• Flash storage/solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Reinstall user's hard drive data cable. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage/SSD. Reinstall user's SSD data cable. Verify issue resolved.	H02	SSD

	Check	Result	Action	Code	Commodity
38.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove wireless card from logic board. Reconnect hard drive power and data cables. Reconnect SSD, if present.</p> <p>Connect power cord to computer, wait five seconds for SMC to become ready, then press power button. Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery.</p> <p>Does computer start up from recovery partition?</p>	Yes	Go to step 39.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 44.	`\${nodeText.noSymptomCode}`	
39.	<p>Inspect wireless card edge connector on logic board for bent pins or housing damage.</p> <p>Is logic board connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 40.	`\${nodeText.noSymptomCode}`	
40.	<p>Inspect wireless card for damage. Verify clean contact on card edge connector, no soot from electrical short, no broken antenna connections, proper heat transfer pad attached, and a flat surface overall. Confirm no bending or broken printed circuit board or EMI shield.</p> <p>Is wireless card damaged?</p>	Yes	Replace the wireless card. Verify issue resolved.	N17	WIRELESS DEVICE
		No	Go to step 41.	`\${nodeText.noSymptomCode}`	
41.	<p>Reseat wireless card connection to logic board.</p> <p>Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery.</p> <p>Does computer start up from recovery partition?</p>	Yes	Issue resolved by reseating wireless card. Verify resolution.	`\${nodeText.yesSymptomCode}`	
		No	Go to step 42.	`\${nodeText.noSymptomCode}`	
42.	<p>To troubleshoot this issue completely, a known-good wireless card is required.</p> <p>Do you have immediate access to a known-good wireless card?</p>	Yes	Go to step 43.	`\${nodeText.yesSymptomCode}`	
		No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
43.	Substitute a known-good wireless card.	Yes	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
	Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See article HT201314: OS X: About OS X Recovery . Verify that Wi-Fi is present. Does computer start up from recovery partition?	No	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M02	MLB
44.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.	Yes	Replace coin battery. Verify issue resolved.	P01	OTHER ELECTRIC
	Use multimeter to measure backup battery coin cell voltage at logic board test points TP2600 and TP2601, to determine whether replacement is needed. A good battery should be above 2.7 volts. Is coin battery below 2.7 volts?	No	Go to step 45.	\$(nodeText.noSymptomCode)	
45.	Locate logic board test points TP2602 and TP2603.	Yes	Go to step 46.	\$(nodeText.yesSymptomCode)	
	Briefly short these two test points together using the tip of a flat blade screwdriver. This resets the computer's Real-Time Clock (RTC). Apply AC power and attempt to start up with a known-good coin battery. Does computer make a startup sound?	No	Replace logic board. Verify issue resolved.	M02	MLB
46.	Verify that computer completes full startup process: Startup sound > gray screen > Apple logo > spinning gear > login screen > user's desktop.	Yes	Issue resolved by resetting the logic board. Verify resolution.	\$(nodeText.yesSymptomCode)	
	Does computer complete startup process to user's desktop?	No	Replace logic board. Verify issue resolved.	M02	MLB

	Check	Result	Action	Code	Commodity
47.	Verify that computer can now complete startup process over multiple trials. Is issue resolved?	Yes	Issue resolved.	\${nodeText.yesSymptomCode}	
		No	ESCALATION REQUIRED. Contact ACS for additional support or a multiple-part repair. Click the Help button in the GSX toolbar, then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Required Tools

Required Tools for iMac (Late 2012 to Late 2015)

The following tools are required to service these models:

- iMac (21.5-inch, Late 2012, Early 2013, Late 2013, Mid 2014, and Late 2015)
- iMac (Retina 4K, 21.5-inch, Late 2015)
- iMac (27-inch, Late 2012 and Late 2013)
- iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

For more information about tools, refer to article [OP101: Hand Tools for Desktop and Portable Repairs](#).

General Tools

- ESD-safe workstation, including an ESD mat and wrist or heel strap
- ESD bags, to store ESD-sensitive parts while removed from the computer
- Black stick or other nonconductive nylon or plastic flat-bladed tool
 - Black stick, pack of 4 (922-5065)
 - Black stick, pack of 24 (922-9004)
 - Black stick, pack of 96 (922-9005)
- Digital volt meter, for troubleshooting
- Earphones, for audio cable reassembly
- Kapton tape
- Magnifying glass, for reading the serial number
- Pentalobe driver (923-0367), for VESA mount
- Phillips #00 screwdriver
- Sticky notes
- Thunderbolt and USB cables, for logic board replacement
- Torx T4 screwdriver (magnetized)
- Torx T5 screwdriver (magnetized)
- Torx T6 screwdriver (magnetized)
- Torx T8 screwdriver (magnetized)
- Torx T10 screwdriver (magnetized)
- Torx T25 screwdriver (magnetized), for 27-inch models

Display Tools

The display is secured to the rear enclosure using adhesive strips. When a repair requires the removal of the display panel, the very high bond (VHB) adhesive strips must be cut and replaced.

Display starter kit and refill kits

Model	Starter kit	Refill kit
iMac (21.5-inch, Late 2012)	076-1444	076-1437
iMac (21.5-inch, Early 2013)	076-1444	076-1437
iMac (21.5-inch, Late 2013)	076-1444	076-1437
iMac (21.5-inch, Mid 2014)	076-1444	076-1437
iMac (21.5-inch, Late 2015)	076-1444	076-1437
iMac (Retina 4K, 21.5-inch, Late 2015)	076-1444	076-1437
iMac (27-inch, Late 2012)	076-1444	076-1419
iMac (27-inch, Late 2013)	076-1444	076-1419
iMac (Retina 5K, 27-inch, Late 2014)	076-1444	076-00009
iMac (Retina 5K, 27-inch, Mid 2015)	076-1444	076-00009
iMac (Retina 5K, 27-inch, Late 2015)	076-1444	076-00009

Display starter kit contains:

- Display removal tool (1) (the silver handle shown here), also available separately as 076-00108
- Display removal wheels (8) (the black circle on the left side of tool shown here)

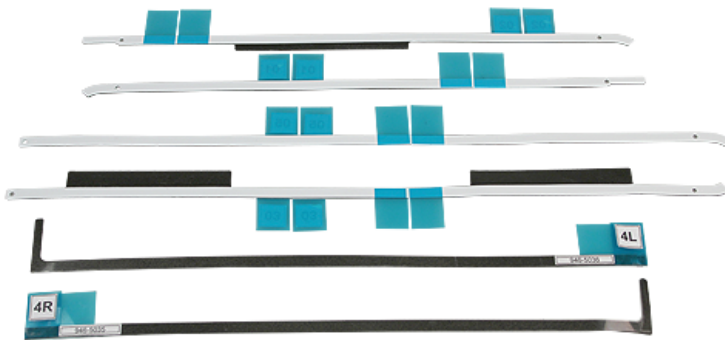


- iMac service foam locking wedge (not available separately)

Note: The number on the side of the foam wedge (944-4365) is an Apple internal part number used for identification. It is not an orderable service part.



- VHB adhesive strip 6-piece set for iMac (27-inch) (4 sets)
- VHB adhesive strip 6-piece set for iMac (21.5-inch) (4 sets)



Display refill kits contain:

- Display removal tool (1), also available separately as 076-00108
- Display removal wheels (20), also available separately as 076-1417
- VHB adhesive strip 6-piece set (20 sets)

Other display tools:

- Display cable extension kit, to test the display panel and cables with the display panel removed
 - 076-1428 for iMac (21.5-inch, Late 2012 to Late 2015 (1.6 GHz) models)
 - 076-00200 for iMac (Retina 4K and 2.8 GHz, 21.5-inch, Late 2015 models)
 - 076-1431 for iMac (27-inch, Late 2012 and Late 2013)
 - 076-00010 for iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)
- Display removal tool (076-00108)
- Display removal wheels, pack of 20 (076-1417)
- ESD bags, 27x18-inch, pack of 5 (923-01193), for a 27-inch display
- ESD bags, 21x16-inch, pack of 5 (923-01194), for a 21.5-inch display
- Isopropyl alcohol (IPA) wipes, 95% or higher isopropyl
- LCD service support stand (923-0416), to support the LCD panel or when working on a VESA mount-adapted system



- Painter's tape (tape that does not leave a residue, 1 to 2 inches wide, but preferably 2-inch, if available)
- Polishing cloths, anti-static, optical-grade microterry, pack of 5 (922-8263)
- Power supply protective covers (923-0189), to use when performing live adjustments with the display panel removed
- Sticky silicone roller (6-inch) (922-8261), to adhere VHB strips to the display panel

- Sticky sheet pads (922-8262), to clean silicone roller or pick up shards of broken glass

Wireless Card Tools

- Thermal material (twinpak) kit (076-1425)
- Thermal pad kit (076-1445)

Note: On July 17, 2013, a new thermal pad kit replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards. The new thermal pad kit is included with wireless card and logic board replacement parts, and is also available separately (076-1445). If your packet of thermal material (076-1425) has not expired, then you may use it; however, it is easier, cleaner, and quicker to install a thermal pad.

Whenever you remove or replace the wireless card, check for the original thermal material. If it is present, then remove the original thermal material, clean the area with an IPA wipe, and install one thermal pad to the wireless card.

- Wireless card support tool:
 - 923-00774 for iMac (21.5-inch, Late 2015) and iMac (Retina 4K, 21.5-inch, Late 2015)



- 923-00775 for iMac (Retina 5K, 27-inch, Late 2015)



Cleaning and Handling a Broken Display Panel

Cleaning and Handling a Broken Display Panel for iMac (Late 2012 to Late 2015)

Tools for Cleaning the Display Panel

- Safety glasses
- Service wedge (iMac) (included with the display panel starter kit, 076-1444)
- Clean, damp cloth (to clean display panel glass)
- Isopropyl alcohol (IPA) wipes (to remove residual VHB adhesive)

Cleaning the Display Panel

1. Clean the front of the display with a clean, damp, lint-free cloth. **Note:** Do not use IPA wipes to clean the display. IPA wipes should only be used to remove residual VHB adhesive.
2. Polish the display panel with an anti-static, micro-terry, optical-grade polishing cloth (922-8263, package of five).



Glass Safety Precautions

These models have a glass display panel that attaches to the front of the computer, which must be removed to access internal components:

- iMac (21.5-inch, Late 2012, Early 2013, Late 2013, Mid 2014, Late 2015)
- iMac (Retina 4K, 21.5-inch, Late 2015)
- iMac (27-inch, Late 2012 and Late 2013)
- iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

Handling a Broken Display Panel

- The display panel's glass is not tempered and will break into sharp pieces if mishandled. Removing the display panel

requires special tools.

- Safety glasses are recommended when removing the display panel.

Tools

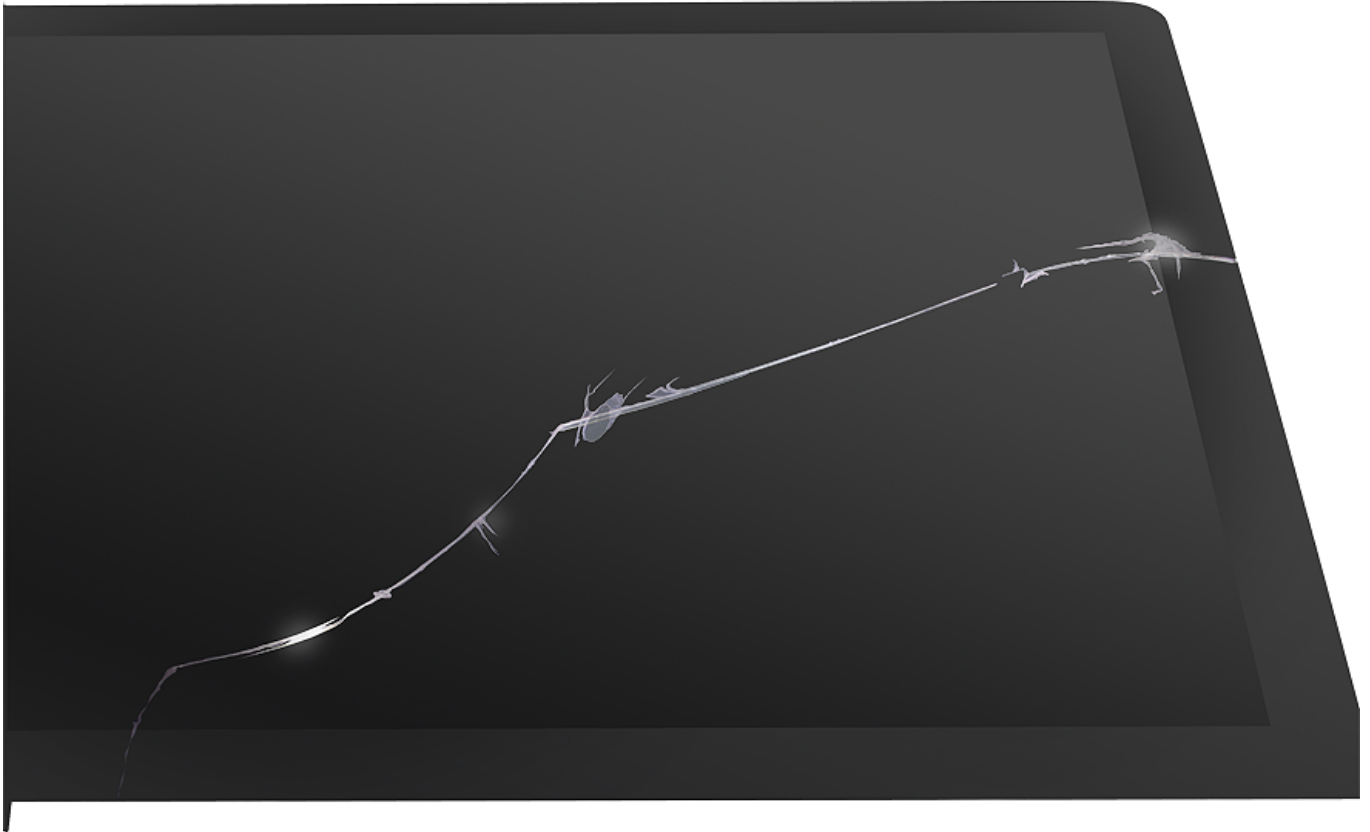
- Display panel starter kit (076-1444)
- Material handling gloves (such as leather or cut-resistant gloves)
- Packing tape or equivalent
- Safety glasses
- Large ESD bags (922-8258) – 24x20-inch bags that accommodate a 21.5-inch display, package of five
- Large ESD bags (922-9468) – 24x30-inch bags that accommodate a 27-inch display, package of five
- Large box for disposal

Safety Information



If the display panel breaks and a glass shard enters the eye:

- Seek medical attention immediately!
- Do not rub your eye if you feel you have something in your eye.
- Do not use an eye wash. An eye wash can push or move the shard of glass and cause more damage.
- Keep the eye closed or loosely patch the eye to keep the eye from moving.



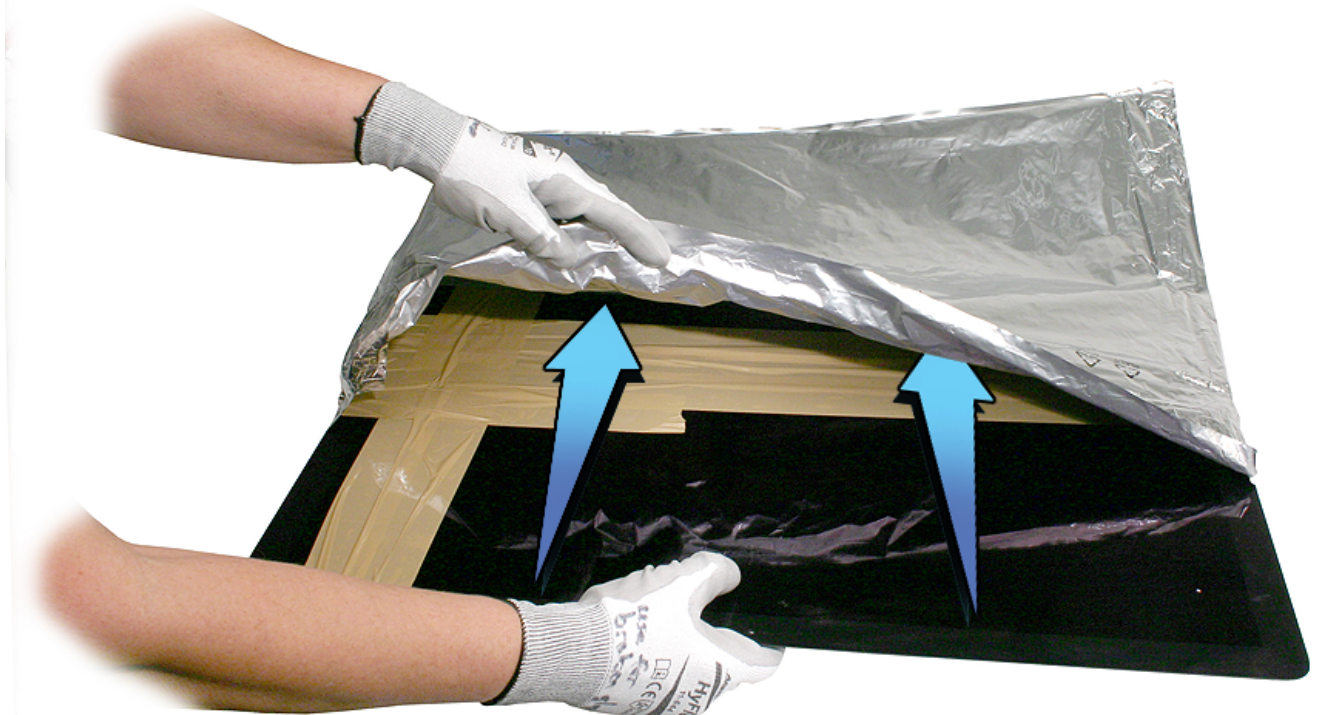
Handling a Broken Display Panel

1. Put on safety glasses and material handling gloves.
2. If the display panel is broken and is still attached to the rear housing, then secure the broken glass with packing tape and carefully follow the Display Panel Removal procedure.
 - [RP1021: iMac \(21.5-inch, Late 2012 to Mid 2014\): Display Panel Removal](#)
 - [RP1230: iMac \(21.5-inch, Late 2015\) and iMac \(Retina 4K, 21.5-inch, Late 2015\): Display Panel Removal](#)
 - [RP950: iMac \(27-inch\): Display Panel Removal](#)
3. Lay the display panel on a smooth, clean work surface.
4. Apply tape, thoroughly covering the broken display panel.



4.

5. Place the taped display panel in the ESD bag that the replacement panel came in (or an equivalent large bag).



6. Place the display panel inside a large box, label the box "Broken Glass," and return the display back to Apple using the normal return process.



Safety

Safety for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



Warning: HIGH VOLTAGE. Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in, because the power supply retains a charge whether or not the computer is on.

Discharge wait time: After unplugging the computer from the electrical outlet, wait two minutes before removing the display panel, disconnecting modules, or substituting cables and components. This will allow the power supply and logic board time to discharge.

- Never remove or install any physical components while the computer is plugged in to an electrical outlet.
- When plugged in, the power supply and logic board are energized, even when the computer is turned off.
- Unplug the computer and allow sufficient time for the power supply and logic board to self-discharge before removing the display panel.
- Do NOT touch the logic board or power supply while the computer is plugged in, or before sufficient time has passed to discharge stored voltage to a safe level after being unplugged.

Refer to article [TP833: iMac and Displays: Power Supply Cover Instructions](#) for additional information on installing the protective covers. The power supply cover provides protection against unintended contact with the energized power supply, which may result in injury from electric shock. ALWAYS use the protective power supply cover during service when the glass panel and LCD have been removed from the iMac, LED Cinema Display, and Thunderbolt Display.

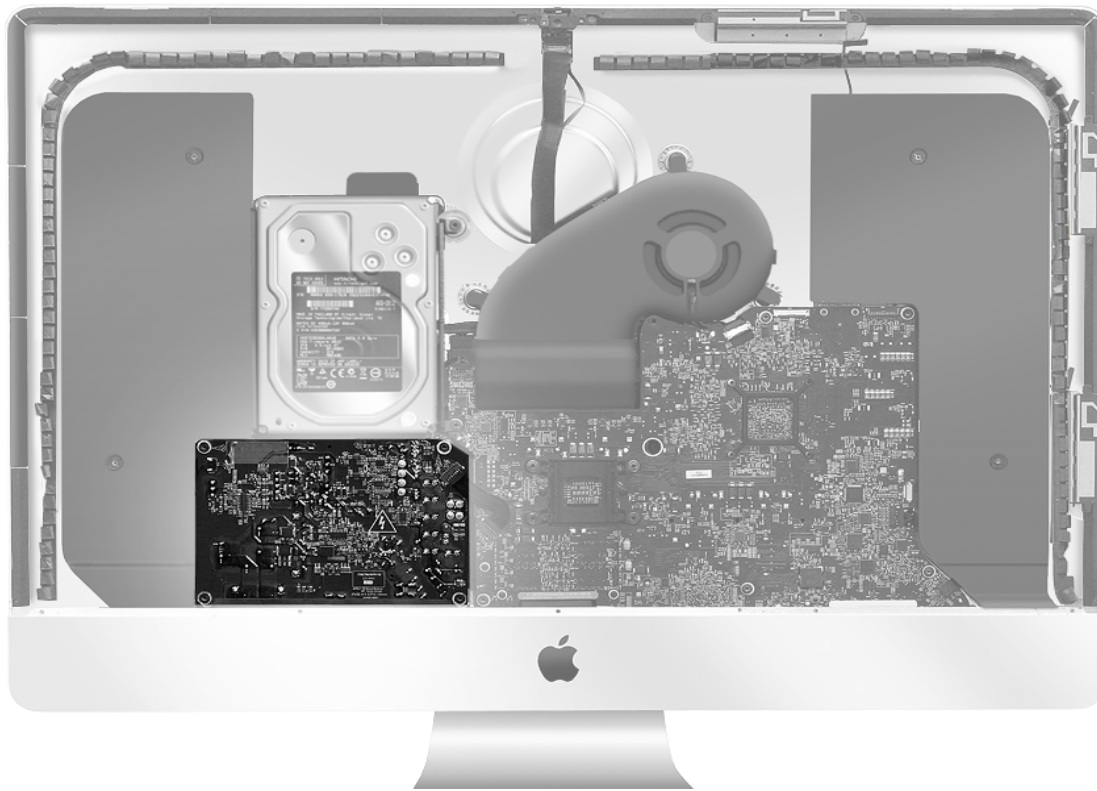
Warning: iMac (Late 2012 and later) models require two protective covers (923-0189) when performing live adjustments; one for the power supply and one for the backlight control circuitry on the logic board. Secure the covers to the rear housing with tape, as shown in the last image below.

Electrical Safety Precautions

Before working on a computer with exposed, potentially energized parts:

- **Remove rings, watches, necklaces, metal-rimmed eyewear, and other metallic articles** which increase your risk of electric shock.
- **Do not wear a cell phone or other signaling device**, as these may cause a dangerous startle reflex during energized work.
- **If the iMac needs to be plugged in for LED checks or similar troubleshooting, do NOT wear an ESD wrist strap.** Wearing an ESD grounding system increases your risk of electric shock in this situation.
- **Remain alert**, focused on the work being performed, and aware of the proximity of grounded objects to your body.
- **Use the plastic black stick or other non-metal extension tool as needed** to connect or disconnect cables, to keep fingers away from potentially energized parts.

iMac (27-inch, Late 2012 and later): Power supply location



iMac (27-inch, Late 2012 and later): Logic board location



iMac (27-inch, Late 2012 and later): Protective power supply cover placement

Warning: Use the protective power supply covers when the computer is plugged in or when performing live adjustments. On these models, place a cover over both the power supply and the logic board when doing live adjustments. Avoid touching the logic board or power supply while the computer is plugged in and the display panel has been removed.

Refer to articles:

- [TP833: Power Supply Cover Instructions](#)
- [TP981: Testing the Panel Using the Display Extension Cable Kit](#)



Take Apart Procedure Notes

Reassembly Steps

When no replacement steps are listed, replace parts in exact reverse order of Removal procedure.

Note About Images in This Guide

In some cases a pre-production model may have been used to document the procedures in this guide. Although there may be small differences in appearance between the image pictured and the computer you are servicing, the procedures are the same unless noted.

Screw Sizes

All screw sizes shown are approximate and represent the total length of the screw.

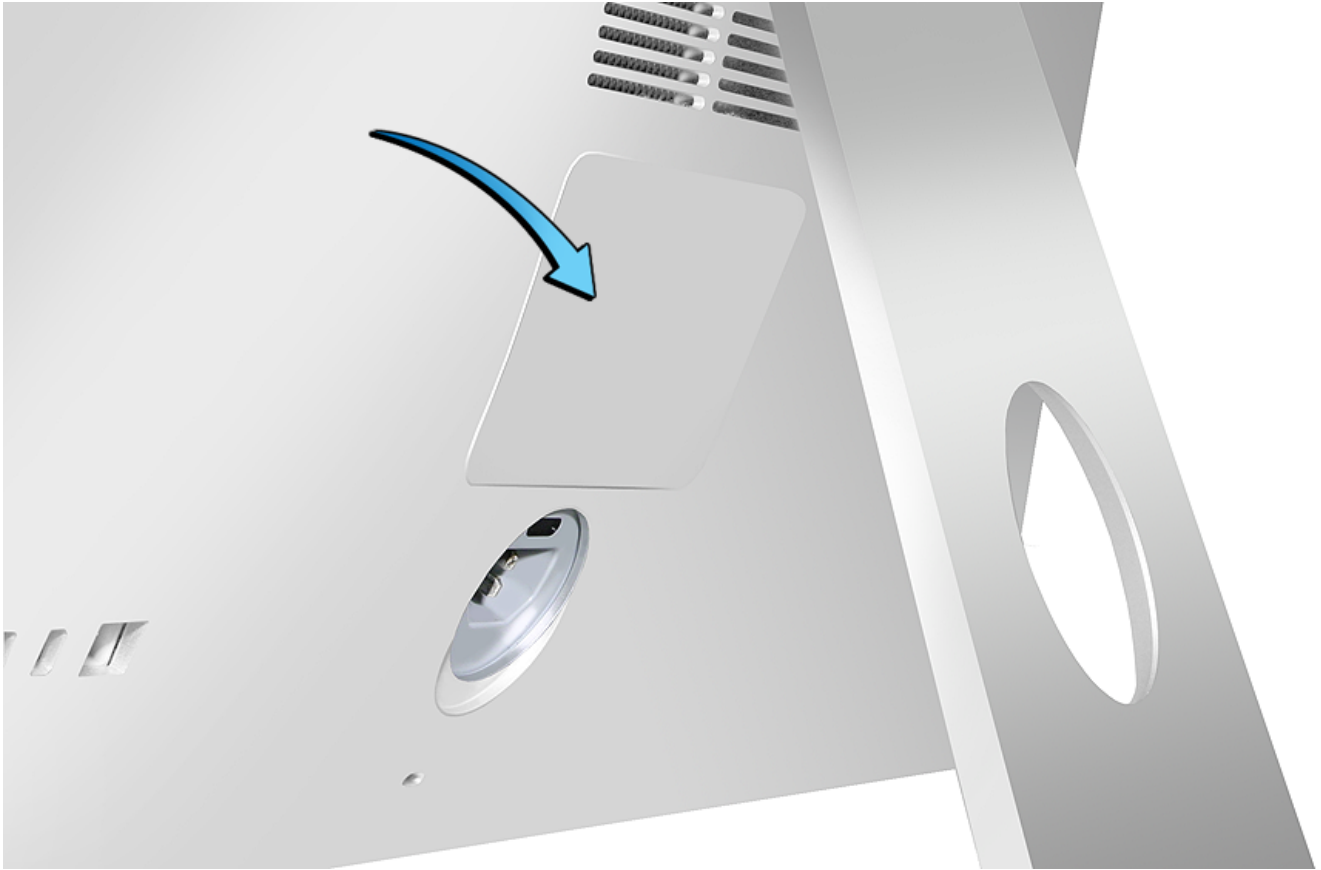


RAM Access Door

First Steps

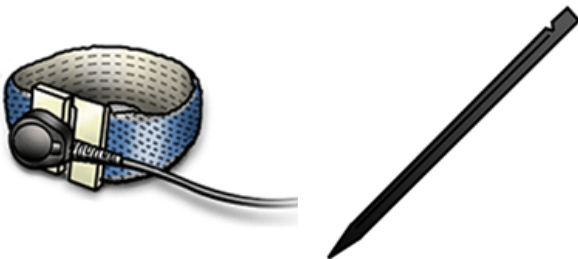
Before you begin:

- Shut down the computer.
- Unplug power and disconnect peripherals.
- Put on an ESD wrist strap.



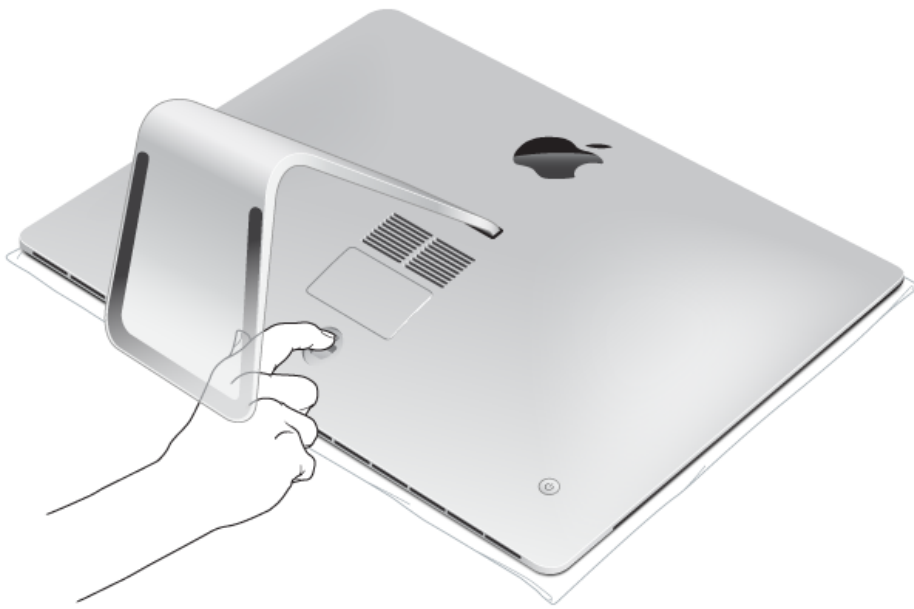
Tools

- ESD wrist strap and mat
- Black stick or flat-blade screwdriver
- Clean towel or soft cloth

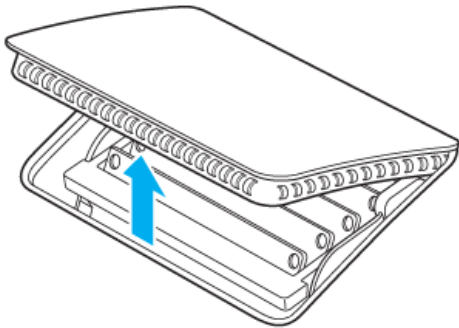


Steps For Removal

1. Place a soft and clean towel or cloth on desk or other flat surface to prevent scratching the display.
2. Lay the computer face down on the towel or cloth.
3. For this step, use your finger, a black stick, or a small flat-blade screwdriver. Open the SDRAM compartment door by pressing the small black button located just above the AC power port. The SDRAM compartment door will open as the button is pushed in.



4. Remove the compartment door and set it aside.



Steps For Reassembly

Reinstall the RAM compartment door. There is no need to press the compartment door release button when replacing the compartment door.

Memory

First Steps

General Information

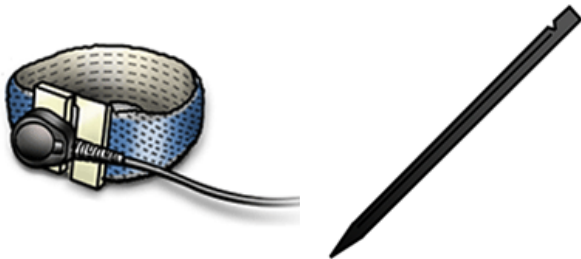
iMac (27-inch, Late 2012 to Late 2015) computers have four SO-DIMM DDR3 SDRAM (synchronous dynamic random-access memory) slots located in a compartment on the rear of the computer, just above the AC power cord receptacle. You can use one 4GB or 8GB SDRAM SO-DIMM of 1600 MHz DDR3 SDRAM in each slot. The maximum amount of SDRAM you can install in the iMac is 32GB (one 8GB SO-DIMM in each slot).

Memory Location



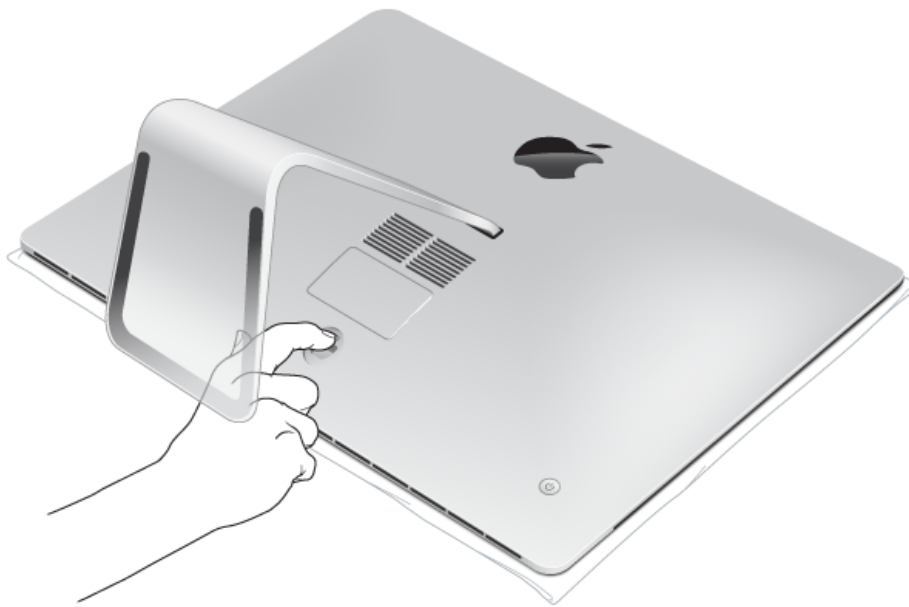
Tools

- ESD wrist strap and mat
- Black stick
- Soft cloth or clean towel

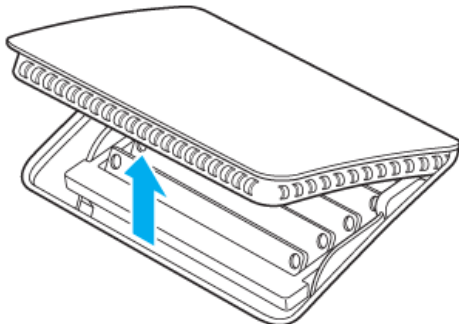


Steps For Removal

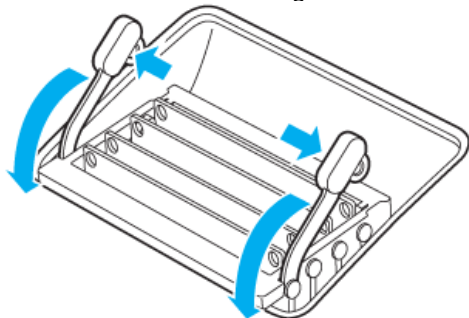
1. Turn off the computer by choosing Shut Down from the Apple () menu.
2. Disconnect the power cord and all other cables from the computer.
3. Place a soft, clean towel or cloth on the desk or other flat surface to prevent scratching the display.
4. Hold the sides of the computer and carefully lay the computer face down on the towel or cloth.
5. For this step, use your finger or a black stick:
 - Open the SDRAM compartment door by pressing the the small button located just above the AC power port.



- The SDRAM compartment door will open as the button is pushed in. Remove the compartment door and set it aside.
Note: There is a diagram on the underside of the compartment door which shows the memory cage levers and the orientation of the DIMM.



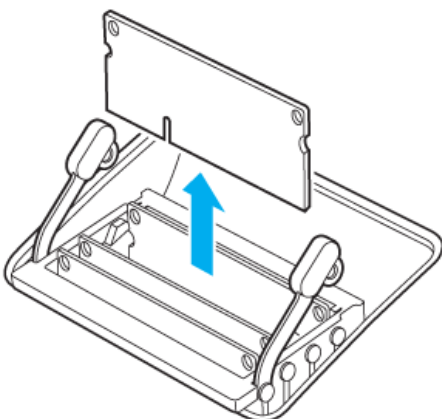
- Locate two levers on the right and left sides of the memory cage. Push the levers outward to release the memory cage.



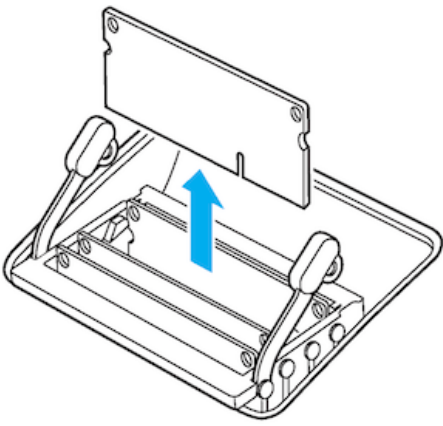
6. After the memory cage is released:

- Pull the memory cage levers toward you, allowing you to access each individual DIMM slot.
- Remove a DIMM module by pulling the module straight up and out, handling it only by the left and right edges.

iMac (27-inch, Late 2012)

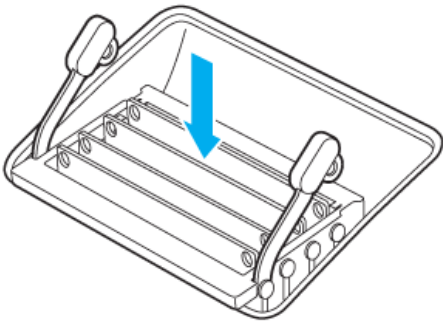


iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

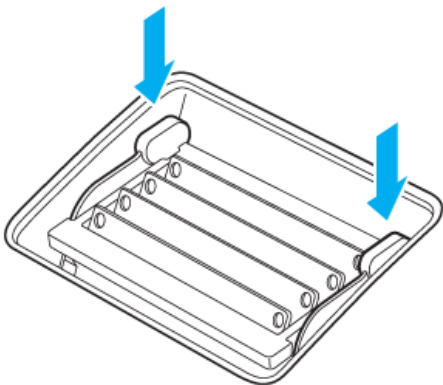


Steps For Reassembly

1. Replace or install a DIMM by setting it down into the slot and pressing until you feel the DIMM click into the slot.



2. After you have installed the modules, push the memory cage levers back into the housing until they click back into place.



3. Place the computer in an upright position.
4. Reconnect the power cord and all other cables to the computer, then start up the computer.

Display Panel Removal

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV116: Display Panel Removal Video](#).

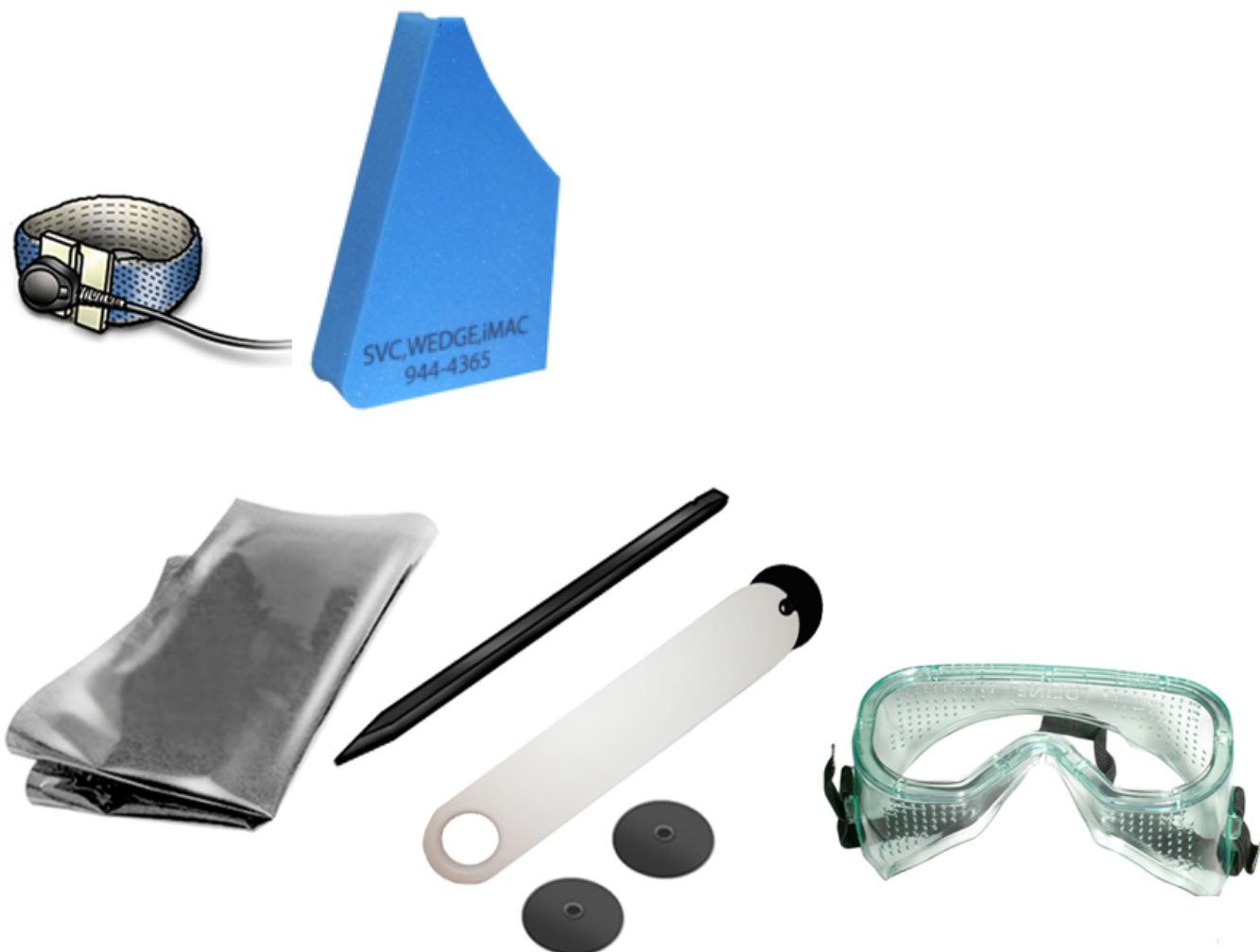
Before you begin:

- Shut down the computer.
- Unplug power and disconnect peripherals.
- Put on an ESD wrist strap.



Tools

- ESD wrist strap and mat
- Service wedge (iMac)
- ESD-safe bag
- Black stick
- Display removal tool
- Replacement wheels for display removal tool (several)
- Safety glasses



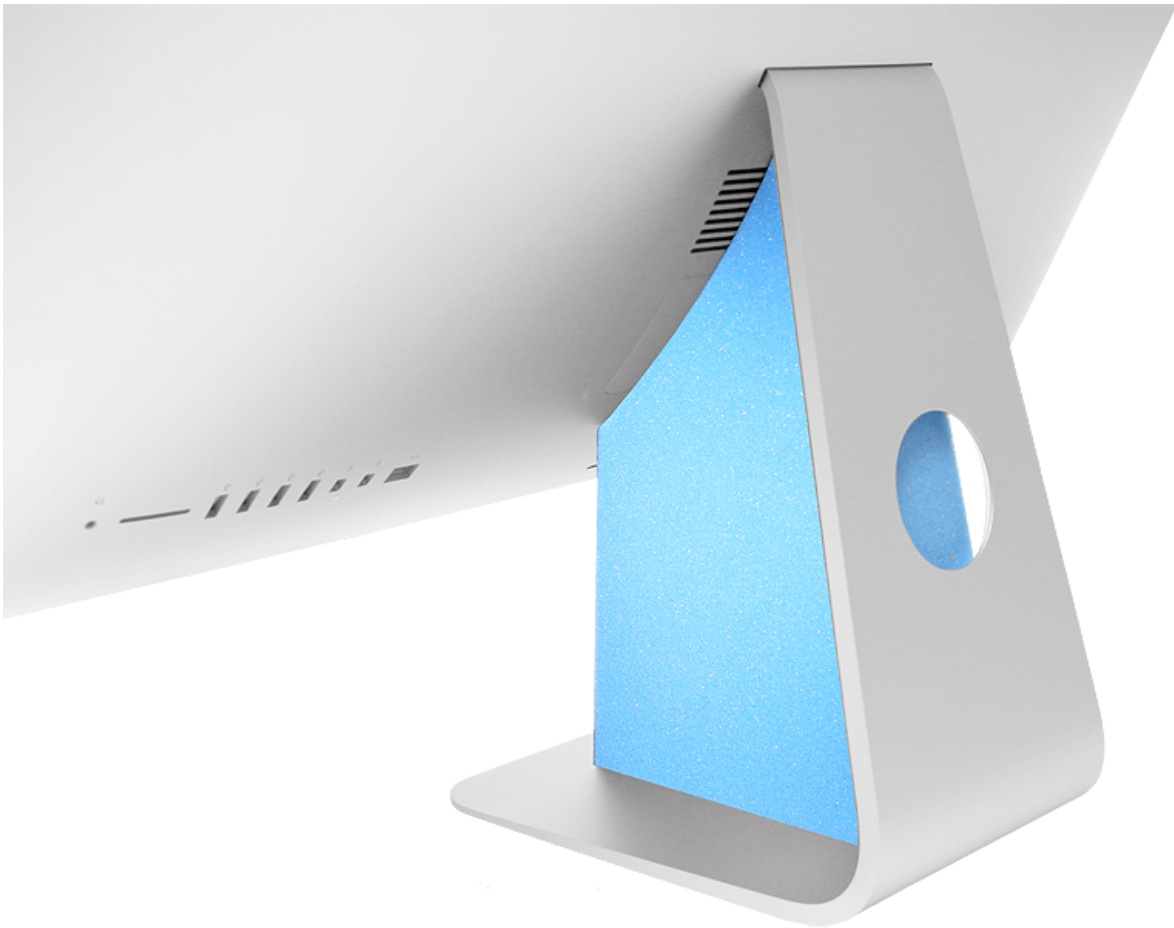
The display panel must be removed for all repairs. The display is affixed to the computer housing with very high bond (VHB) adhesive strips. These VHB strips must be cut with the display removal tool in order to remove the LCD panel. Each VHB strip consists of two adhesive layers and a foam layer (VHB/foam/VHB). When you remove the display, you are cutting primarily through the foam layer.

The main tool is the display removal tool. The tool uses replaceable wheels (076-1417) that cut through the foam layer in the VHB strip. With careful use, these wheels can be reused five to ten times. When the wheel becomes nicked from contact with the chin, further use becomes difficult. Because of this, the tool should only be used along the top and sides of the display, and not along the chin. To remove the VHB strips along the chin, lower the display and pull the outer vertical tab on the strips.

Steps For Removal

Important: In the unlikely event that the display glass cracks or breaks, refer to [TP819: Cleaning and Handling a Broken Display Panel](#).

1. Use the service wedge to hold the display steady. When positioned correctly, the service wedge covers the power receptacle. Rotate the computer so the display panel is facing you.



2. Place a wheel on the removal tool by inserting the wheel into the notch on the handle. Push firmly until the wheel clicks into the notch. The tool cuts the foam core, which is located between two layers of VHB adhesive that secure the display panel to the rear housing.

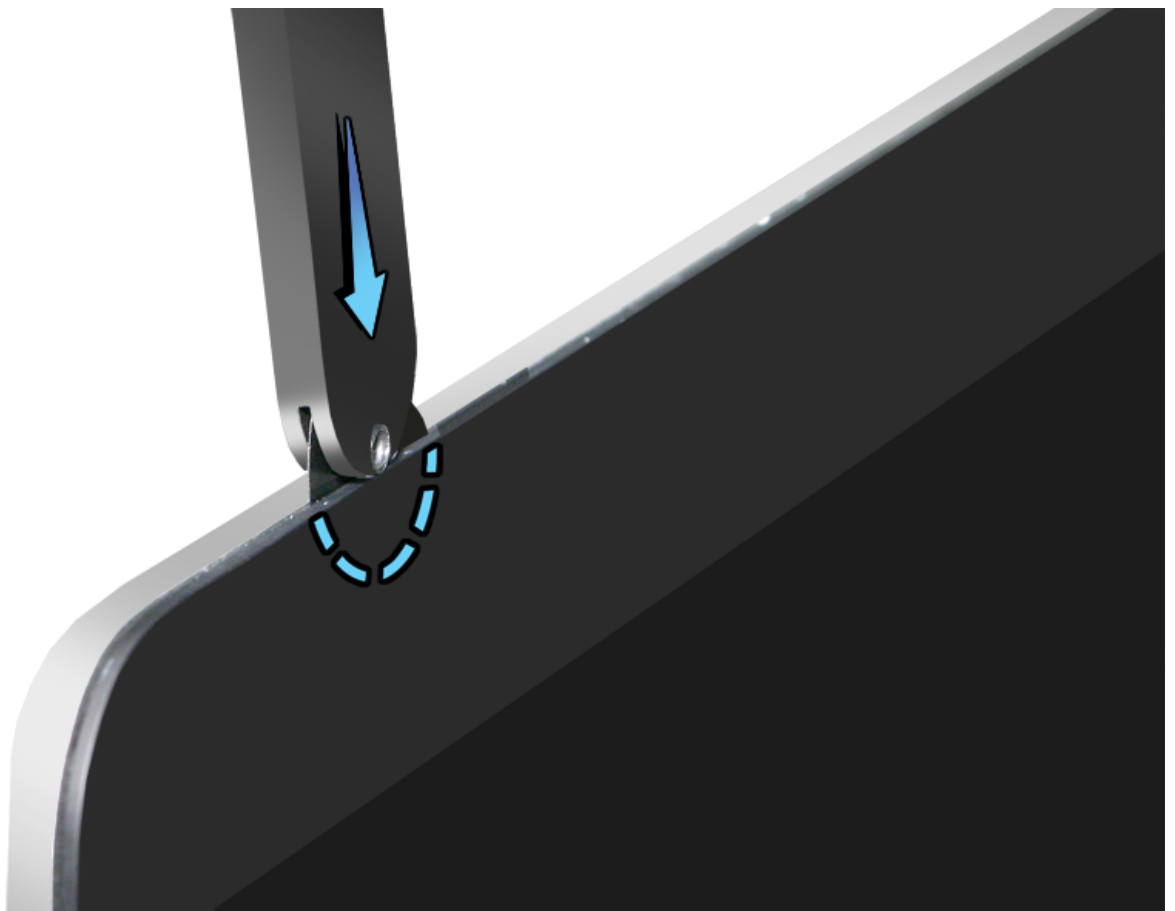
Caution: With careful use, these wheels can be reused five to ten times. When the wheel becomes nicked from contact with the chin, further use becomes difficult. Because of this, the tool should only be used along the top and sides of the display, and not along the chin. To remove the VHB strips along the chin, lower the display and pull the outer vertical tab on the strips.



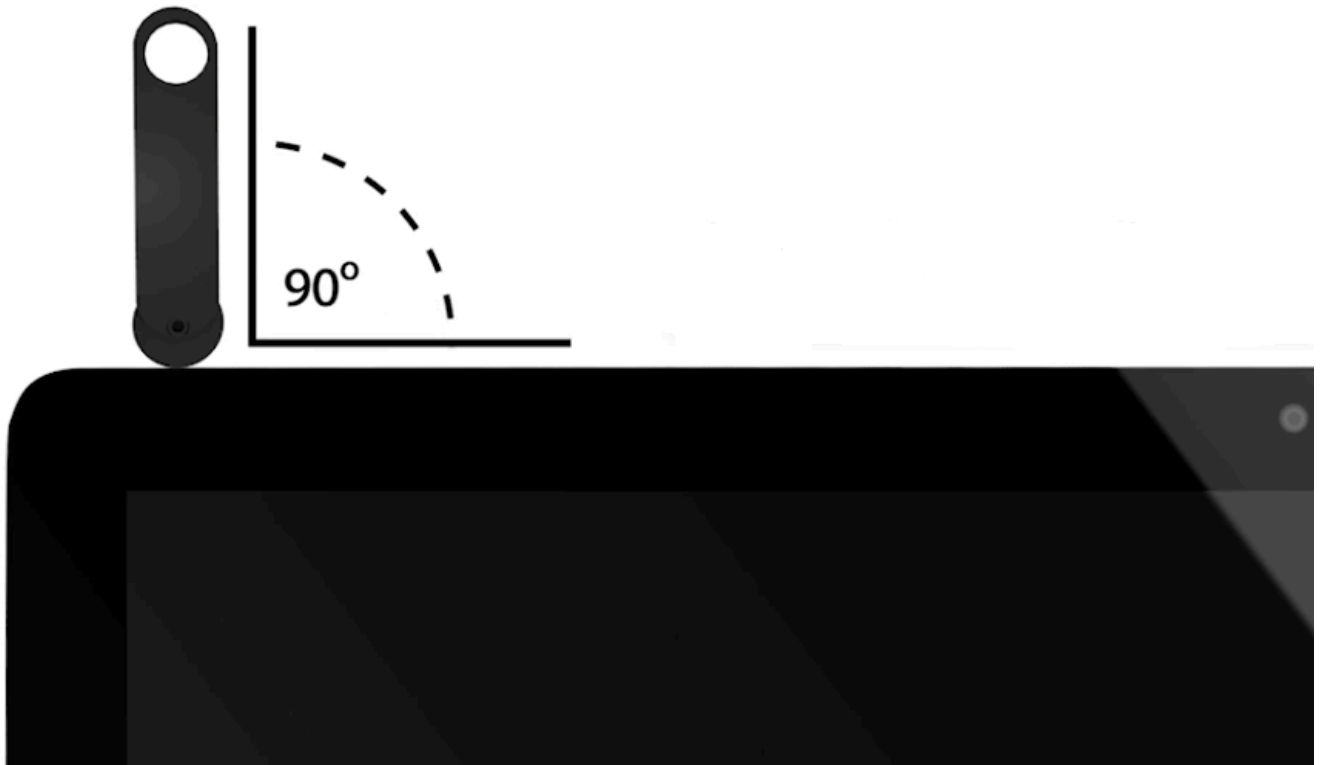
Caution: If the wheel becomes worn during use, then change the wheel. A worn wheel could permanently damage the black Mylar that is adhered to the edges on the back of the display panel glass.



3. Use only the display removal tool to cut through the foam layer of the VHB adhesive. Insert the display removal tool into the gap between the display panel and rear housing. **Note:** The tool should only be used along the top and sides of the display, not along the chin.



4. Hold the display removal tool perpendicular to the edge of the computer.

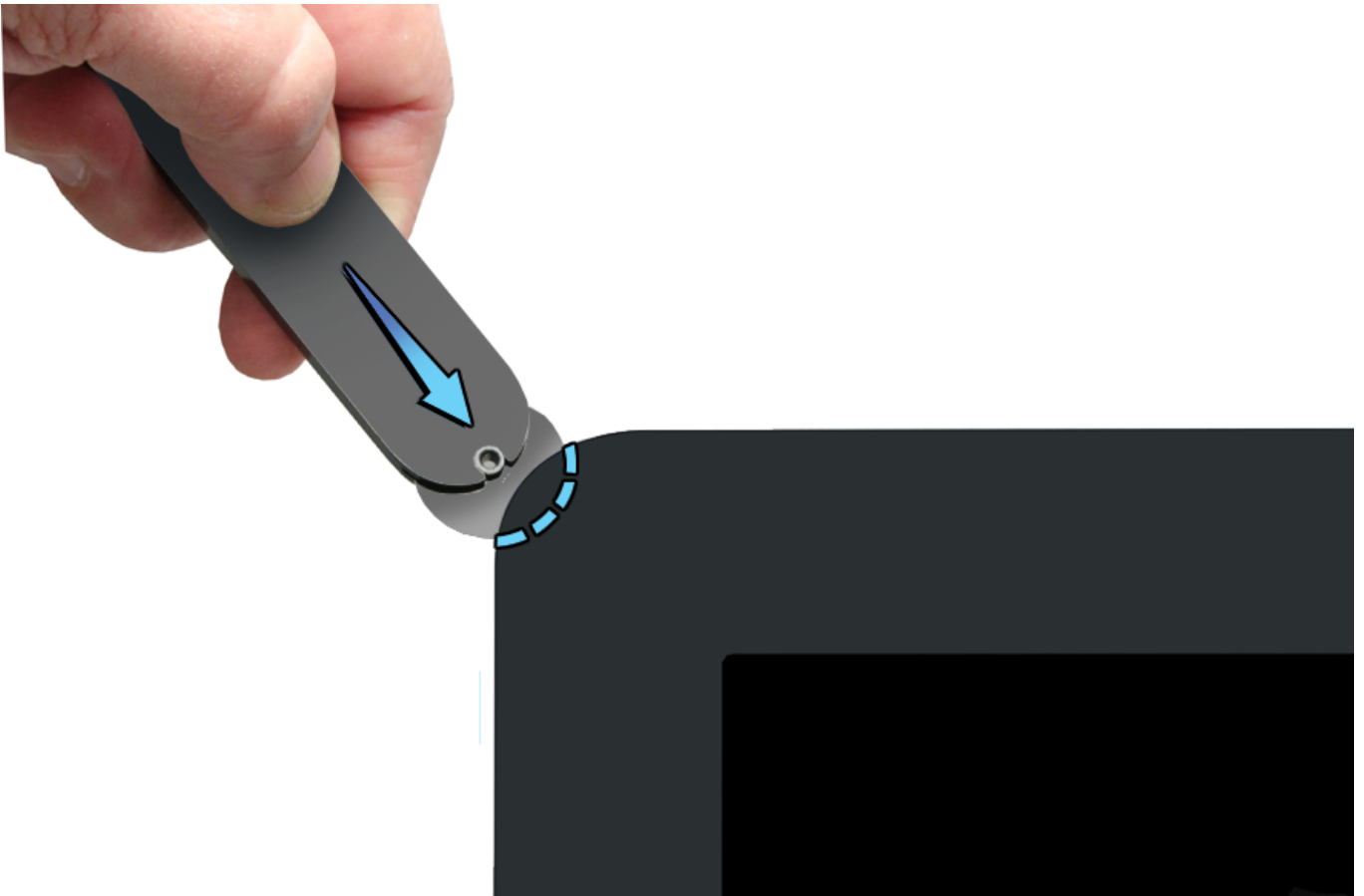


5. Roll the tool along the top and sides of the display panel. Move the tool back and forth until it moves with minimal resistance.

Note: Because there is no VHB adhesive at the top center, where the camera is located, there is no need for a continuous swipe across the top.



6. Pay special attention to the top corners, as the tool must make steady contact with the display and housing.



7. Use the flat end of a black stick to gently remove any visible VHB from the edges of the rear housing.

Caution: Forcing the black stick between the display panel and the rear housing may cause the display panel to fracture.



Caution: Pay special attention to the location of the Wi-Fi/Bluetooth antennas. **Do not pry** in these areas with the black stick.



8. Use the black stick and your fingers to carefully separate the display panel from the top of the rear housing. If there is resistance, then you need to remove more VHB material.





9. Tilt the display open slightly, just enough for your hand to reach the cables that connect the display to the logic board.

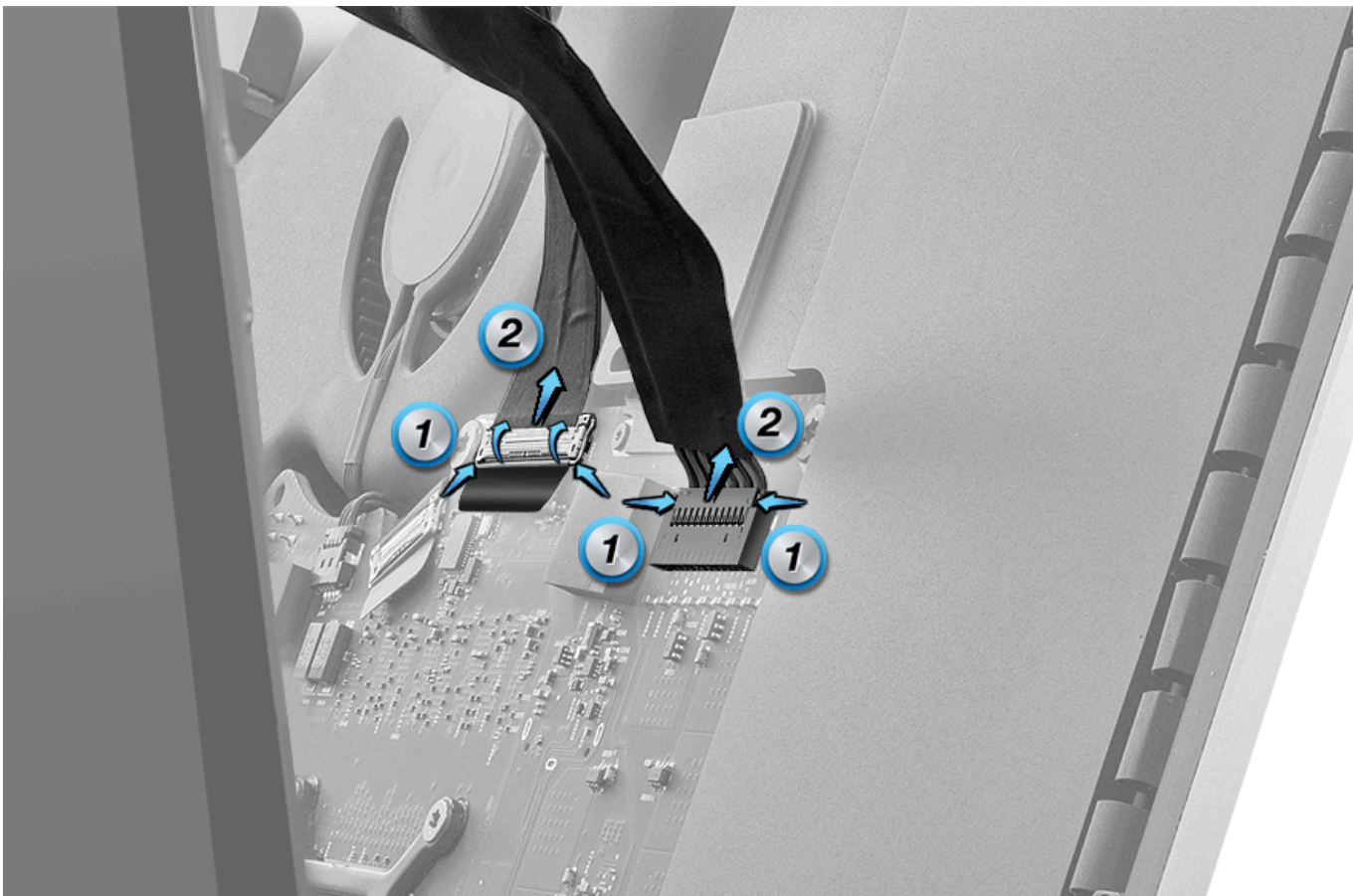
Caution: Be extremely careful not to stress the display cables and connectors (on the logic board) when tilting the display open. The display connectors on the logic board are easily damaged. If the connectors are damaged, then the logic board will need to be replaced.

Remember that the bottom edge of the display is still attached with VHB. **Do not** remove the display panel yet.

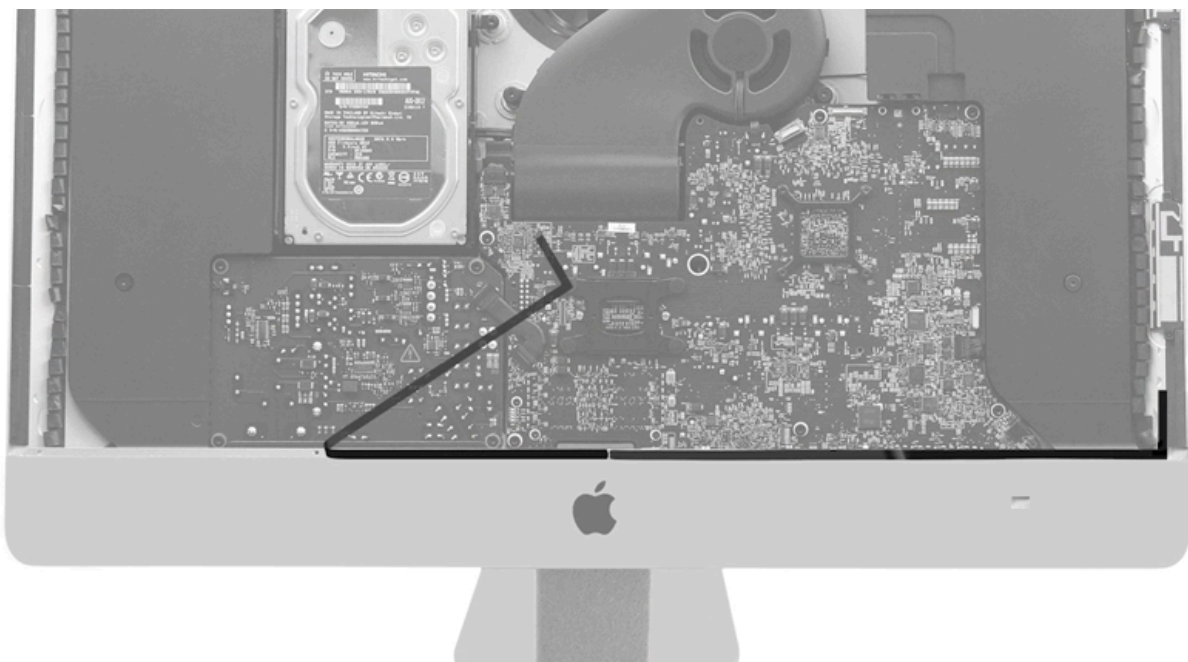


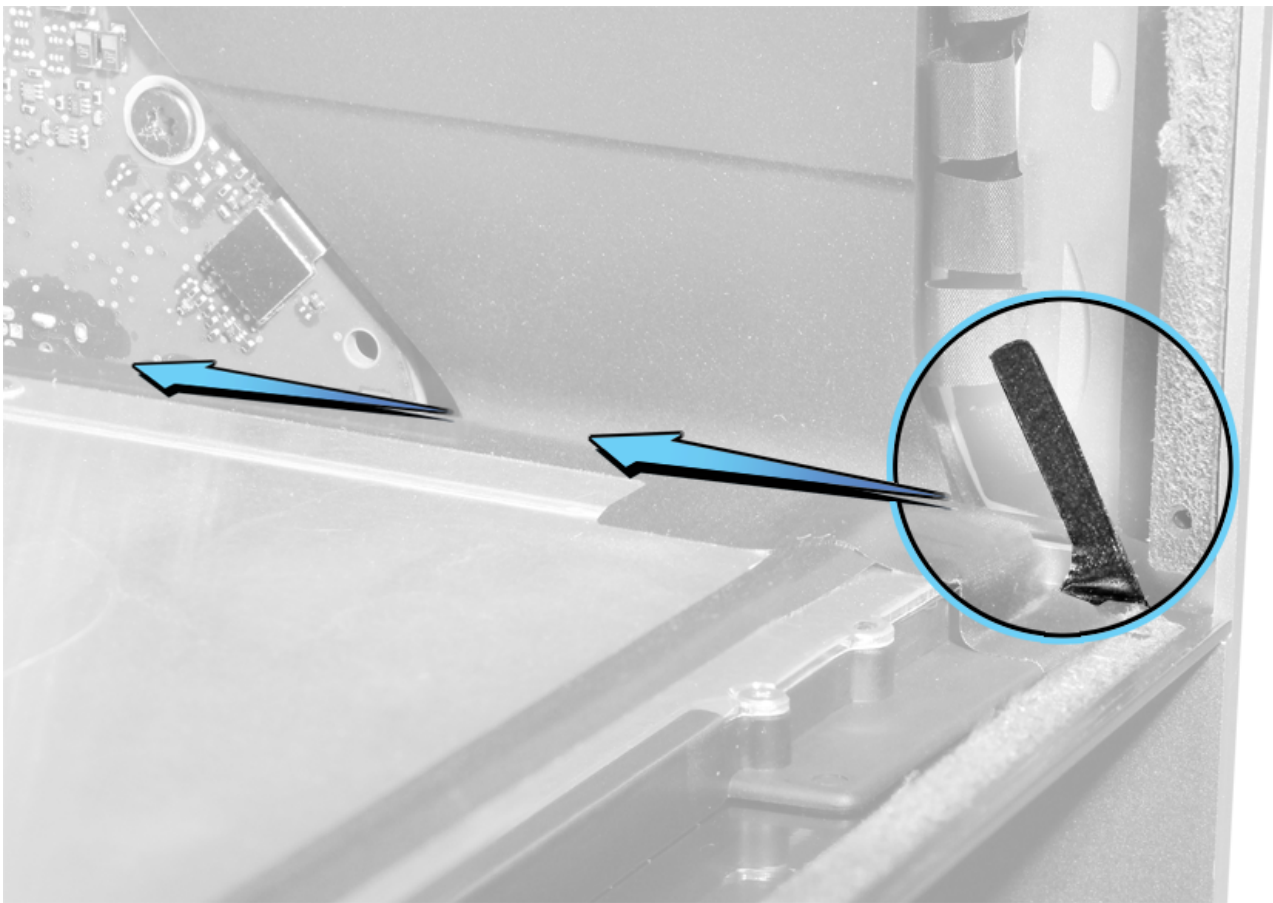
10. Carefully remove the Embedded DisplayPort (eDP) cable (on the left) from the logic board by moving the locking lever (#1) up and pulling the cable (#2) straight out of its connector. Disconnect the display backlight power cable (on the right) from the logic board by pinching the sides (#1) and pulling the power cable (#2) straight out of its connector.

Note: The display backlight power cable is part of the display panel assembly and is not a separate part.



11. Lower the display panel (not shown). Locate the two VHB strips along the chin. Pull the VHB tab on each strip toward the center.





12. Gently pull the display panel off of the rear housing and store it in an ESD-safe bag.

Caution: If the panel is sticking to the rear housing, then use a black stick to carefully break the VHB bond between the display and the iMac rear housing. Be careful not to damage the black Mylar on the display. If the black protective Mylar is pulled from the display, then the display panel may need to be replaced.



Steps For Reassembly

1. Remove the [display panel VHB strips](#).
2. Install new [display panel VHB strips](#).
3. Reinstall the [display panel](#).

Display Panel - Removing Very High Bond (VHB) Strips

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV102: VHB Removal Video](#).

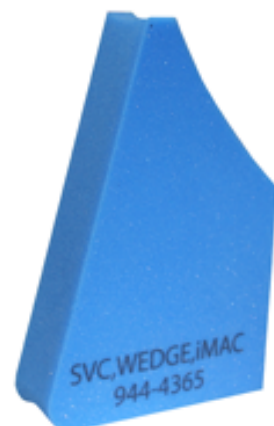
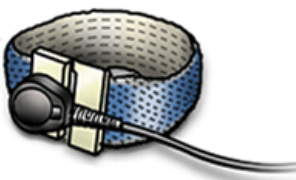
Before you begin:

- [Display Panel Removal](#)



Tools

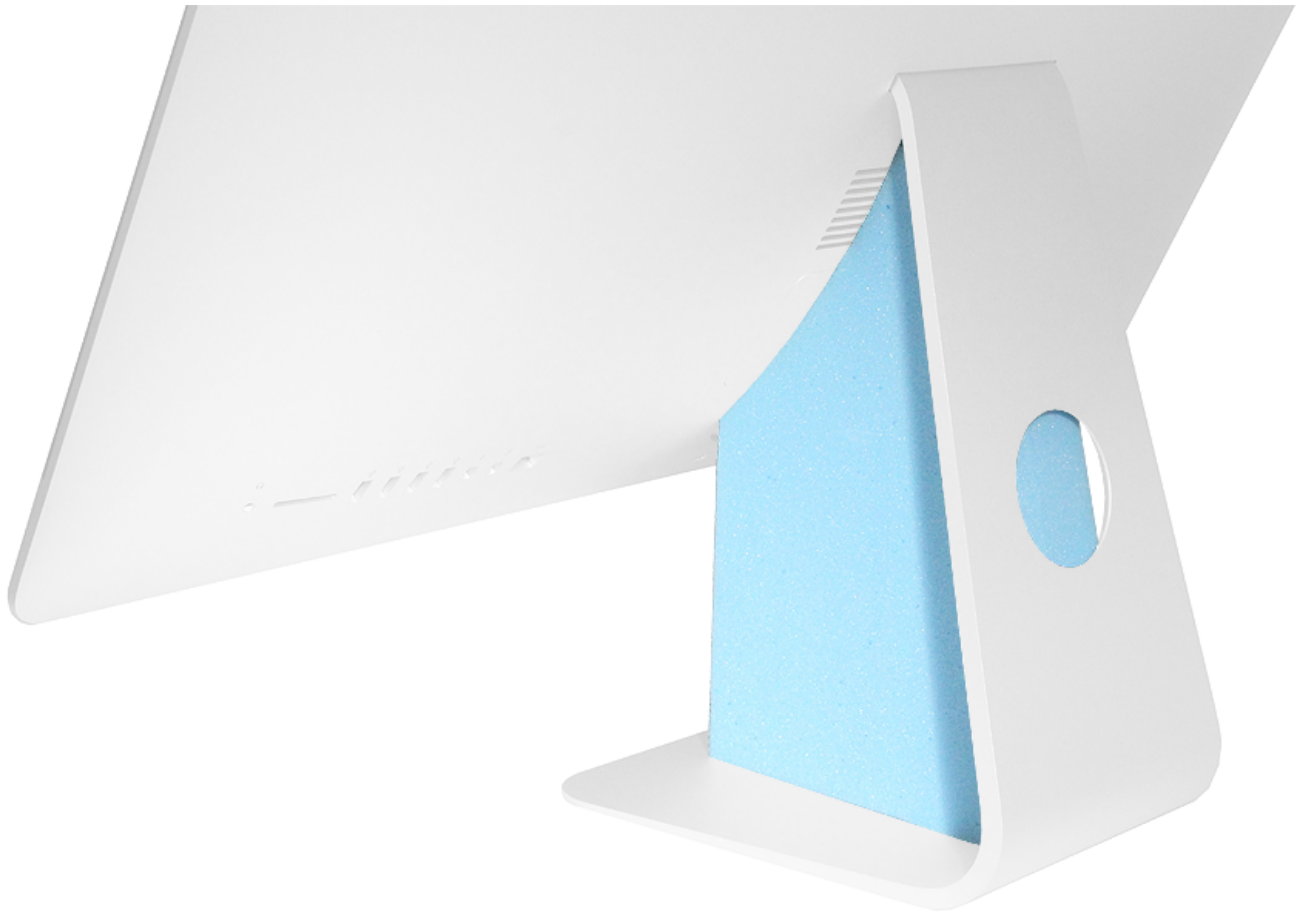
- ESD wrist strap and mat
- Black stick
- Isopropyl alcohol (IPA) wipes
- Service wedge (iMac)



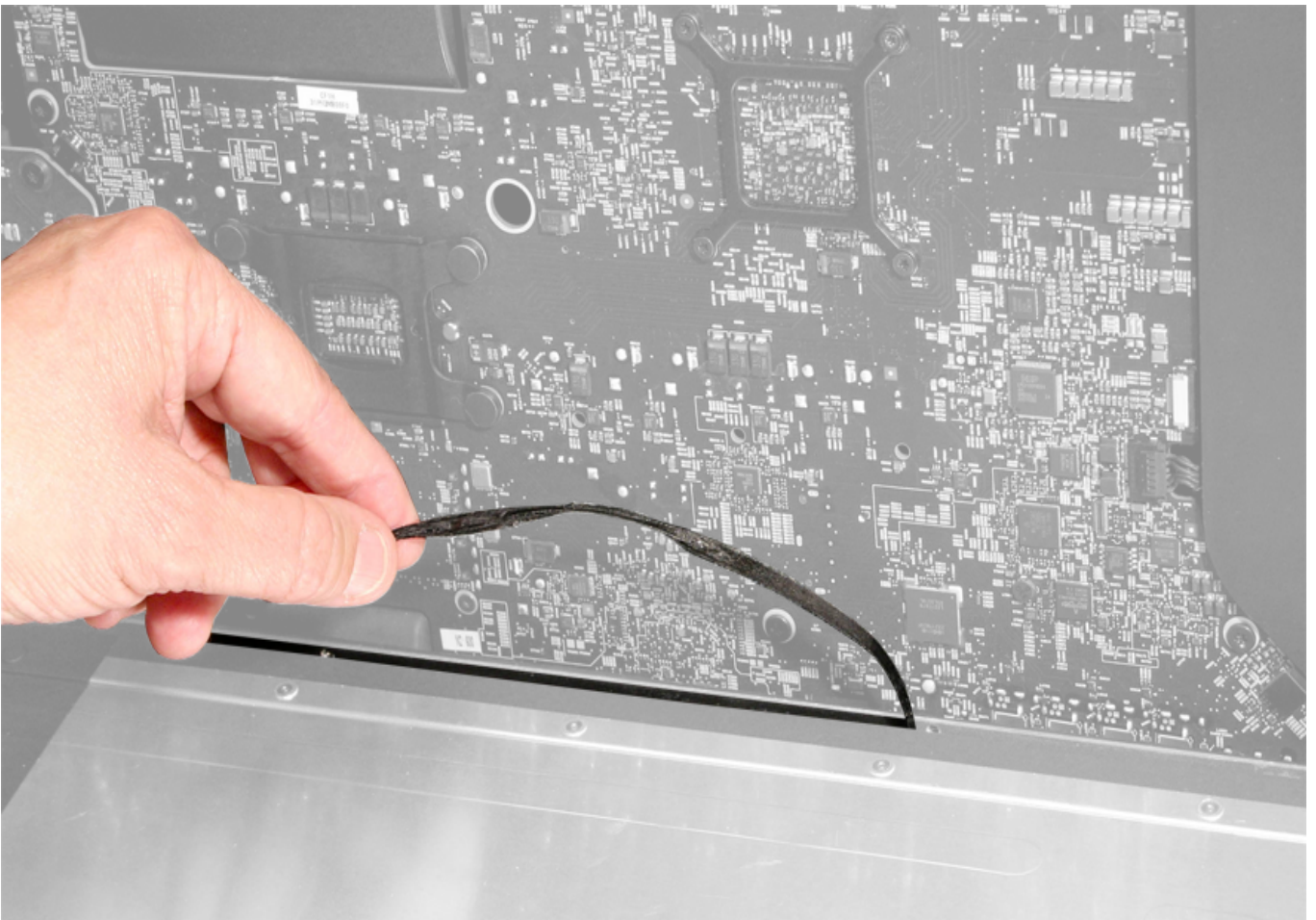
Steps For Removal

Note: On the rare occasion that the display glass cracks or breaks, refer to article [TP819: Cleaning and Handling a Broken Display Panel](#).

1. Insert the service wedge to hold the display steady for this procedure. When positioned correctly, the service wedge covers the power receptacle.



2. Use your fingers and the flat end of a black stick to remove any residual very high bond (VHB) adhesive from the rear housing, antennas, and display panel.

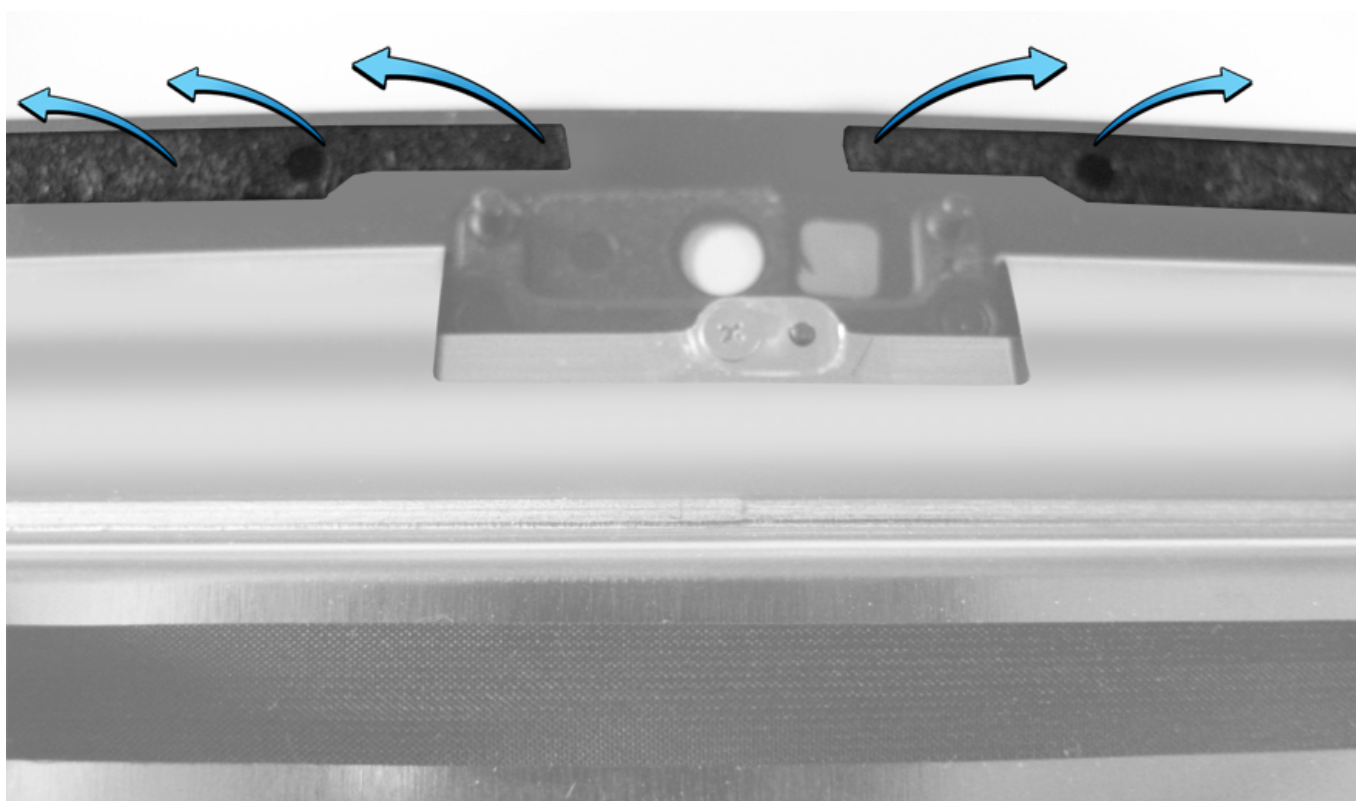


3. **Note:** Use caution when removing VHB from the display panel, to prevent damage to the black Mylar protective film that is located on the display panel glass. Ensure that you are peeling up the VHB and not the Mylar film. An easy way to ensure that you do not peel up the Mylar film on the display is to start peeling the VHB from the center points, not the ends of the display.

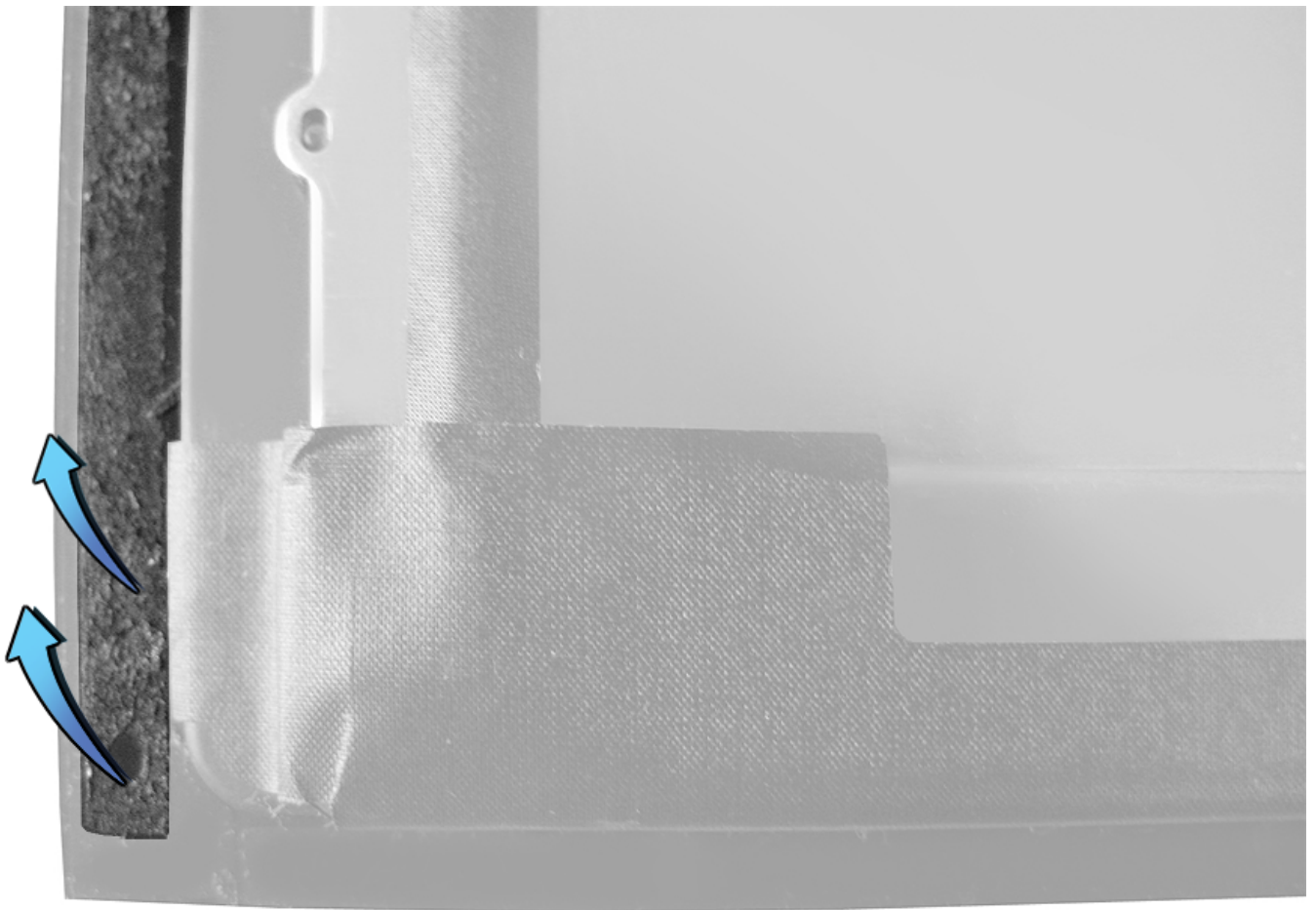
Peeling VHB from the display panel:



Top of display shown, peeling VHB to the left and right, above the camera module location.

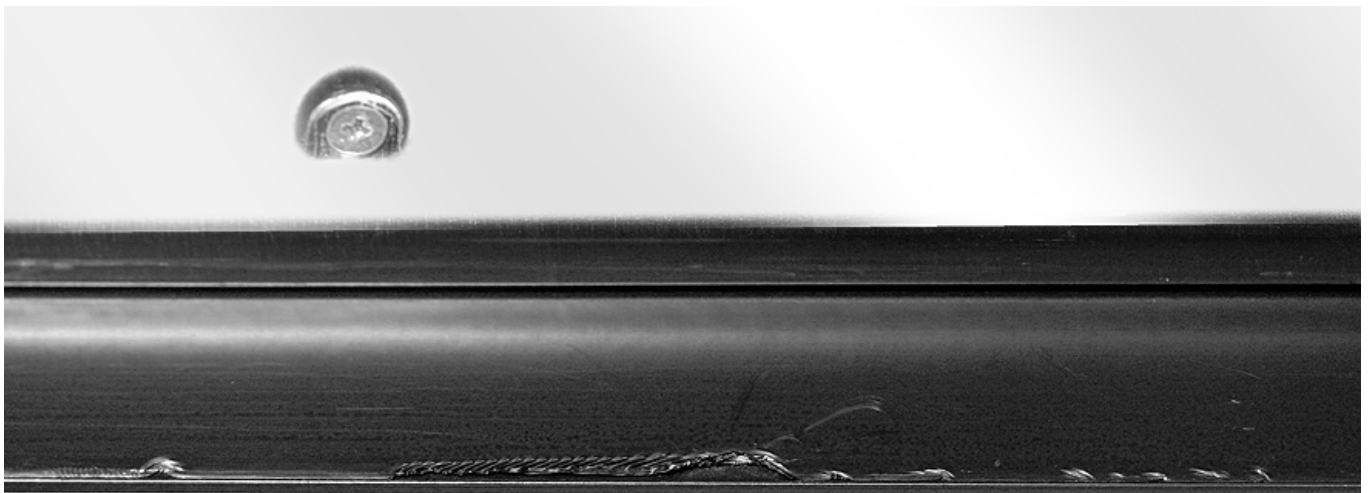


At the bottom corners of the display, peel the VHB upward.



If the black protective Mylar film is peeled or wrinkled on the display (as shown below), then press the film back onto the panel with your finger. The Mylar should be smooth and undamaged. Use caution when working around the black Mylar protective film. If the Mylar is pulled from the display, then the display panel may need to be replaced.

Display panel Mylar damage:

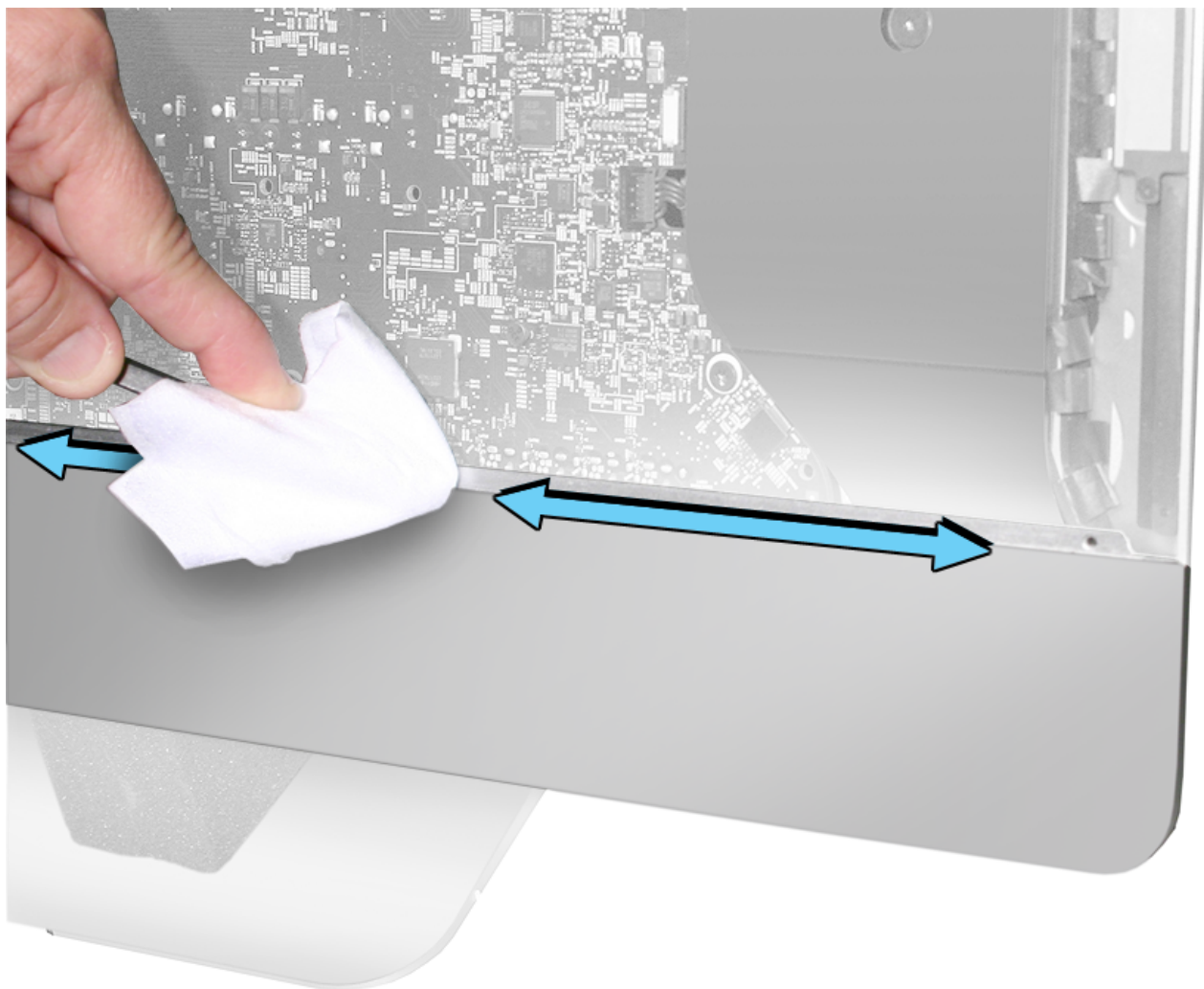


Do not peel VHB from the display corners. The chance of damaging the black Mylar protective film is greater if VHB removal is started in the corner.



4. Remove any remaining adhesive by wiping the rear housing and display panel edges clean with an IPA wipe. Continue until the surfaces no longer show VHB residue.

Caution: Do not use IPA wipes on the display. IPA wipes should only be used to remove residual VHB adhesive. Be careful not to get IPA wipes on the display while removing the VHB residue.





5. Allow the surfaces to dry for one minute.

6. Check again to ensure that the display and rear housing are clean of VHB.

Steps For Reassembly

1. Install new [display panel VHB strips](#).

2. Reinstall the [display panel](#).

Display Panel - Replacing Very High Bond (VHB) Strips

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV115: VHB Installation Video](#).

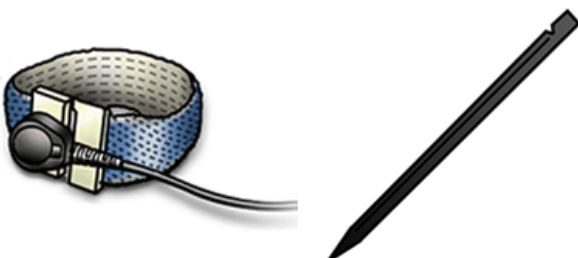
Before you begin:

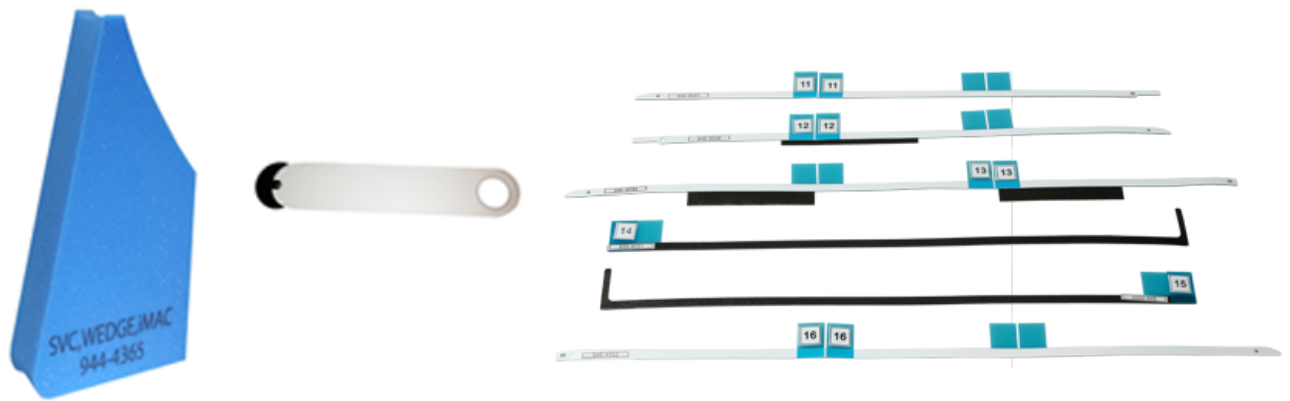
- [Display panel removal](#)
- [Display panel - removing very high bond \(VHB\) strips](#)



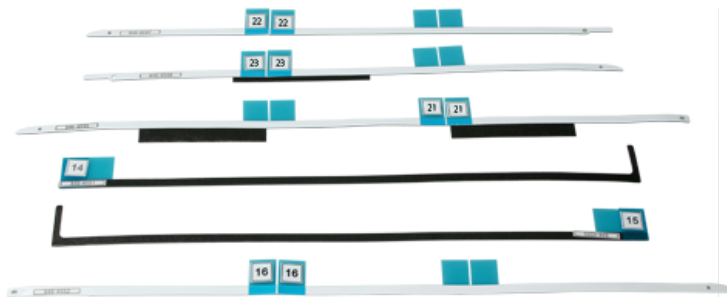
Tools

- ESD wrist strap and mat
- Black stick
- Service wedge (iMac)
- Display removal tool
- iMac (27-inch, Late 2012 and Late 2013) display refill kit, VHB strips, package of 20 (076-1419)
- iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) display refill kit, VHB strips, package of 20 (076-00009)





iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) VHB strips:

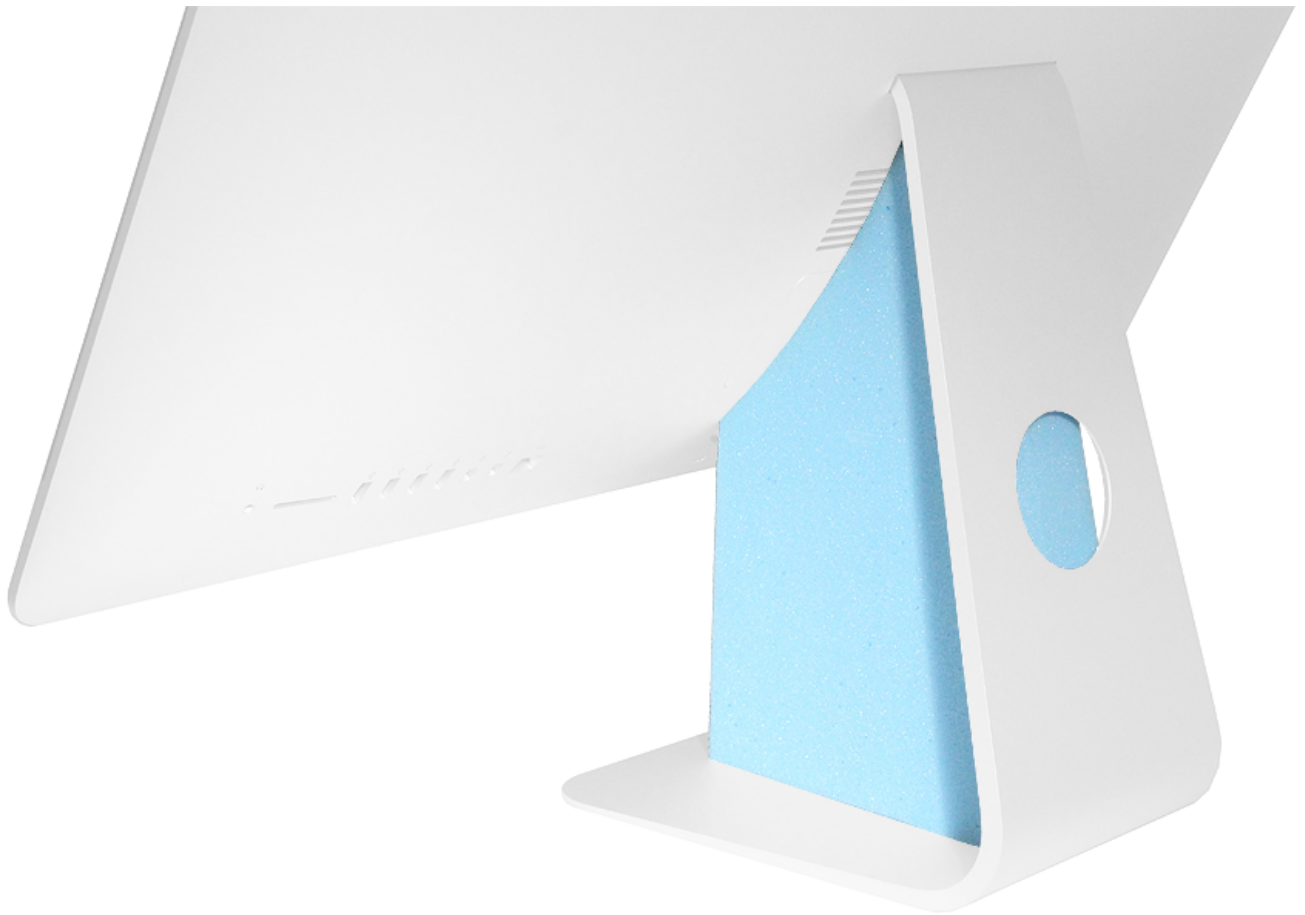


Steps For Removal

This is a reassembly instruction article. For removal steps, see [RP998: Display Panel - Removing Very High Bond \(VHB\) Strips](#).

Steps For Reassembly

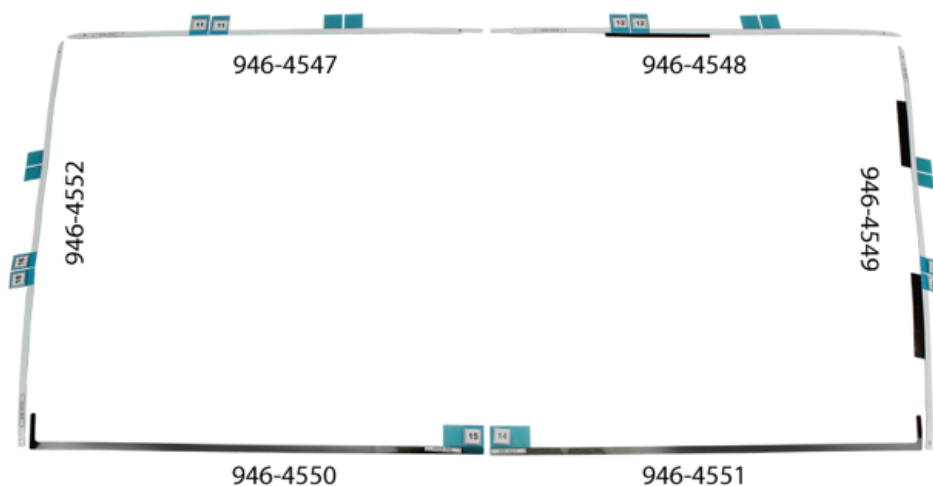
1. Insert the service wedge to hold the display steady. When positioned correctly, the wedge covers the power receptacle. Rotate the computer so the display panel is facing you.



2. Each VHB strip has an ID number (on the pull tab) and part number (beginning with 946) printed on the strip. Use the tables and pictures below to verify that you have all of the needed VHB strips. Lay out the VHB strips before installing them onto the computer and check them for damage. Check that there are no wrinkles or exposed sections on the strip. Damage can cause cosmetic gap issues, make the display bond weak, or create light leakage.

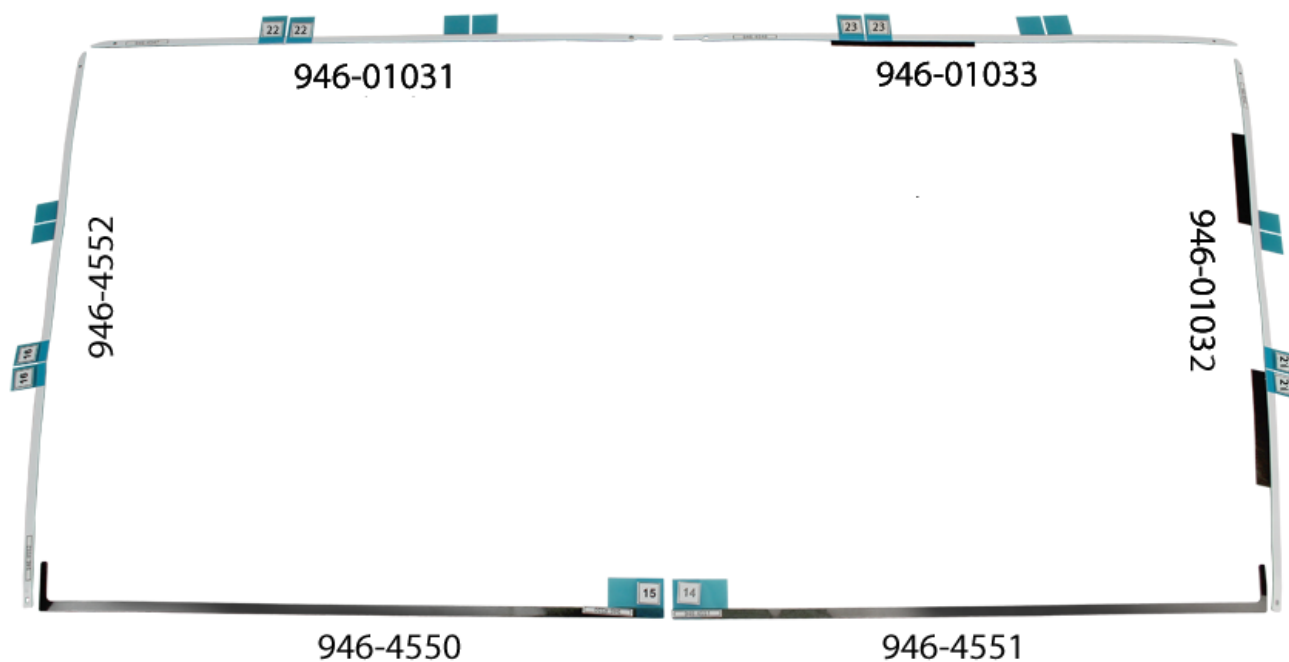
iMac (27-inch, Late 2012 and Late 2013) VHB strips:

VHB Strip Description	VHB Strip ID Number	Part Number on VHB Strip
Top left	11	946-4547
Top right	12	946-4548
Right side	13	946-4549
Bottom right	14	946-4551
Bottom left	15	946-4550
Left side	16	946-4552

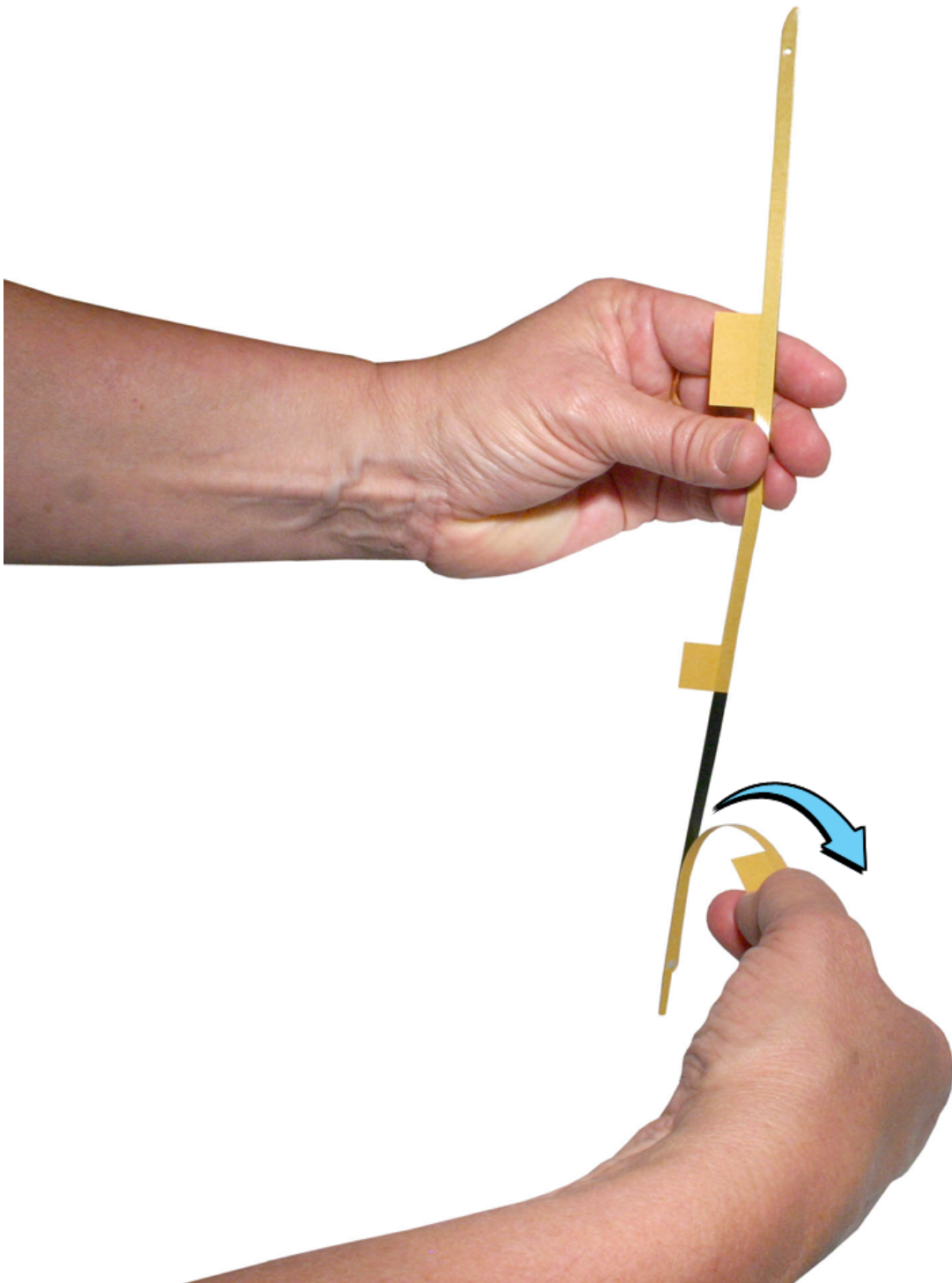


iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) VHB strips:

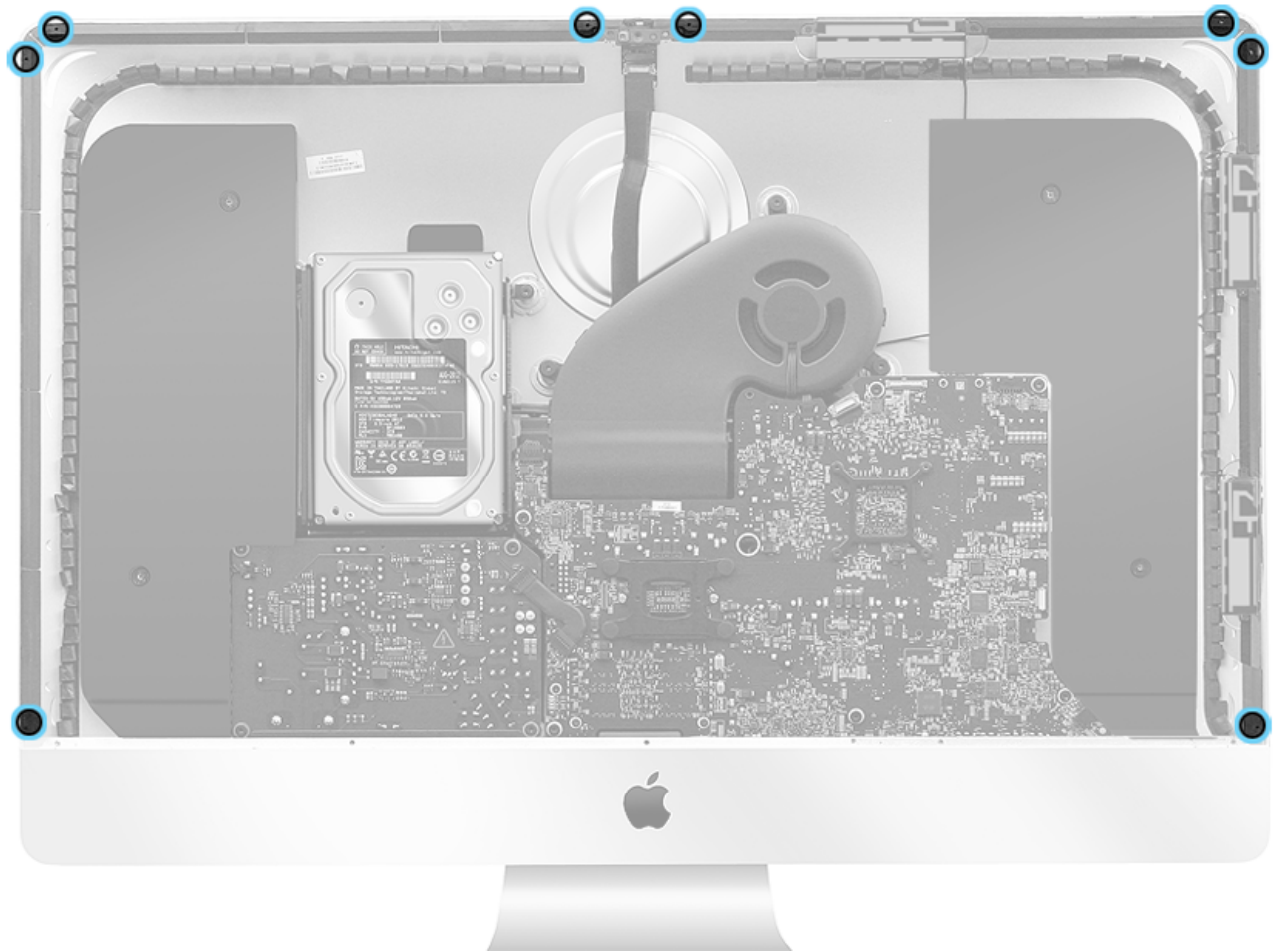
VHB Strip Description	VHB Strip ID Number	Part Number on VHB Strip
Top left	22	946-01031
Top right	23	946-01033 (alternate 946-03774)
Right side	21	946-01032 (alternate 946-03775)
Bottom right	14	946-4551
Bottom left	15	946-4550
Left side	16	946-4552



3. The VHB strips have a foam layer (VHB/foam/VHB), with a removable paper liner on the underside and a clear plastic liner on the top side. The image below shows the process of peeling the paper liner off the underside of the VHB strip.

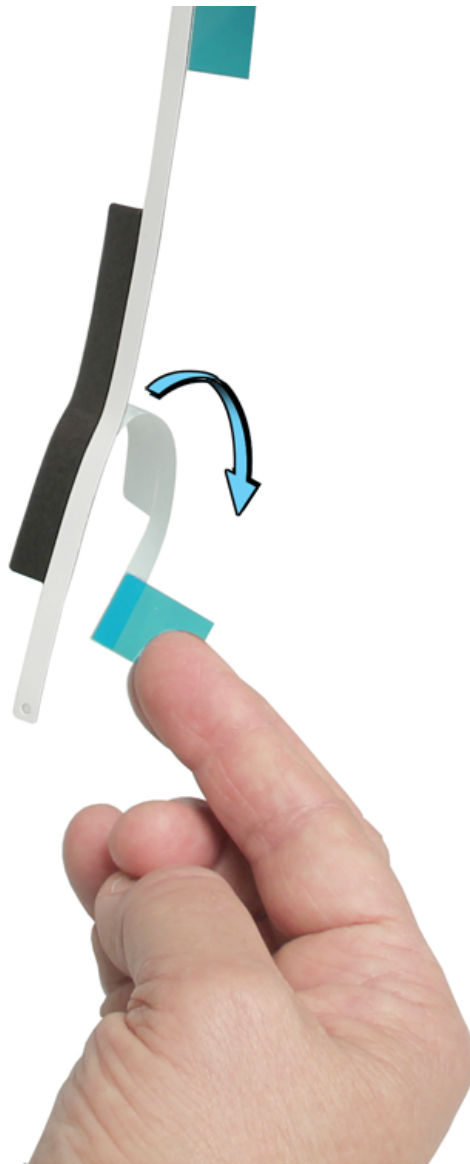


4. The rear housing has eight alignment holes. Use them to align the new VHB strips. **Note:** Before adhering the VHB strips and installing the display, verify that all of the internal cables are connected and all screws are installed.



5. Peel the paper backing off of one portion of the VHB strip. **Note:** The more recent VHB strips are a teal blue color. Some of the procedures that follow show older VHB strips, which are an orange color. The replacement VHB process is the same regardless of color.





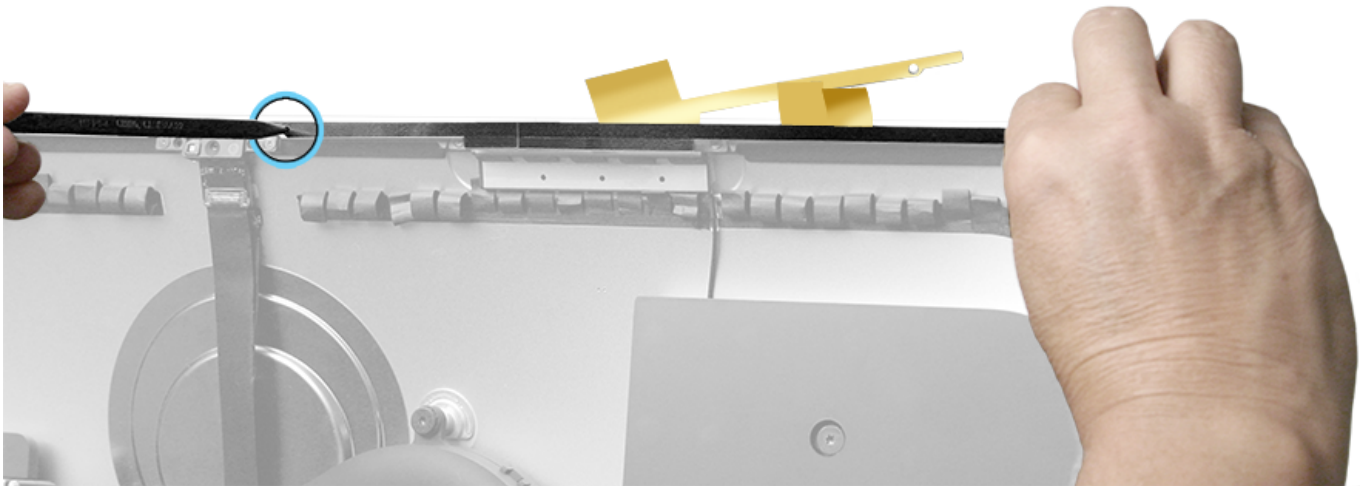
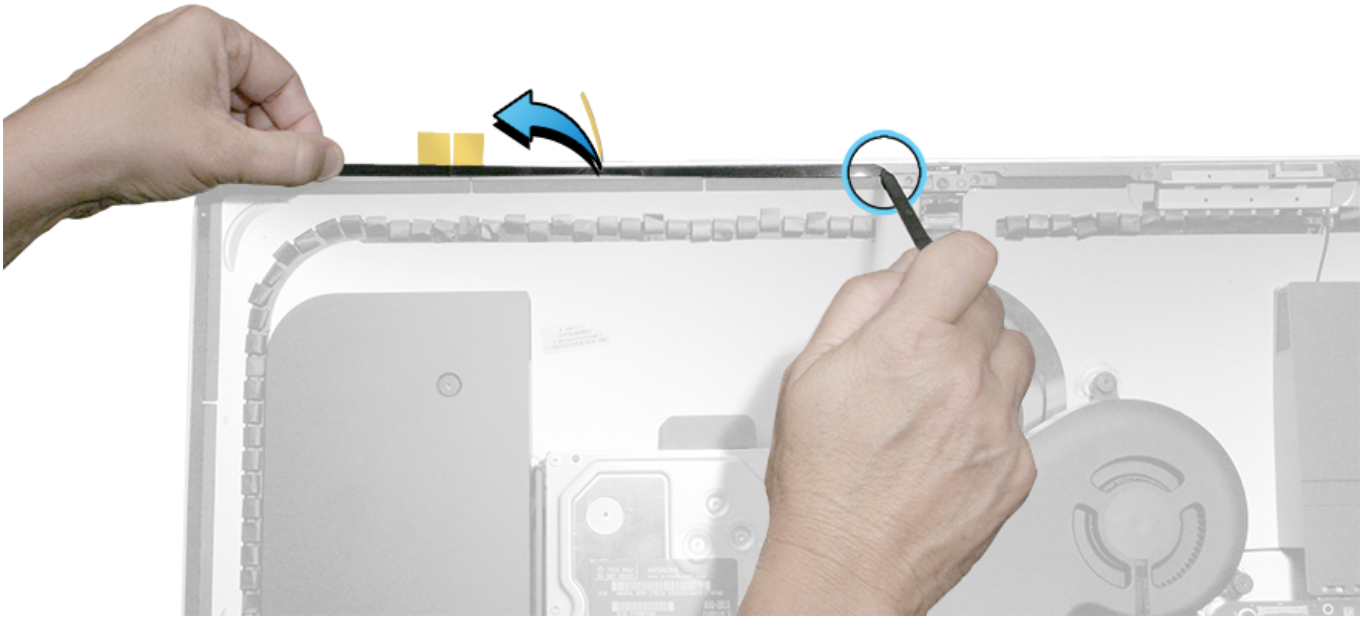
6. Use the pointed end of a black stick to align the VHB strips on the rear housing. **Note:** The paper liner side faces the rear housing.
7. As you position the VHB, use your finger to peel the remaining paper liner from the underside of the VHB strip.
8. Use your finger to press the VHB strip into place on the rear housing. **Note:** If a VHB strip does not line up correctly, remove it and start again.
9. Do not remove the clear plastic liners from the top layer of the strip at this time. Remove them right before you replace the panel.



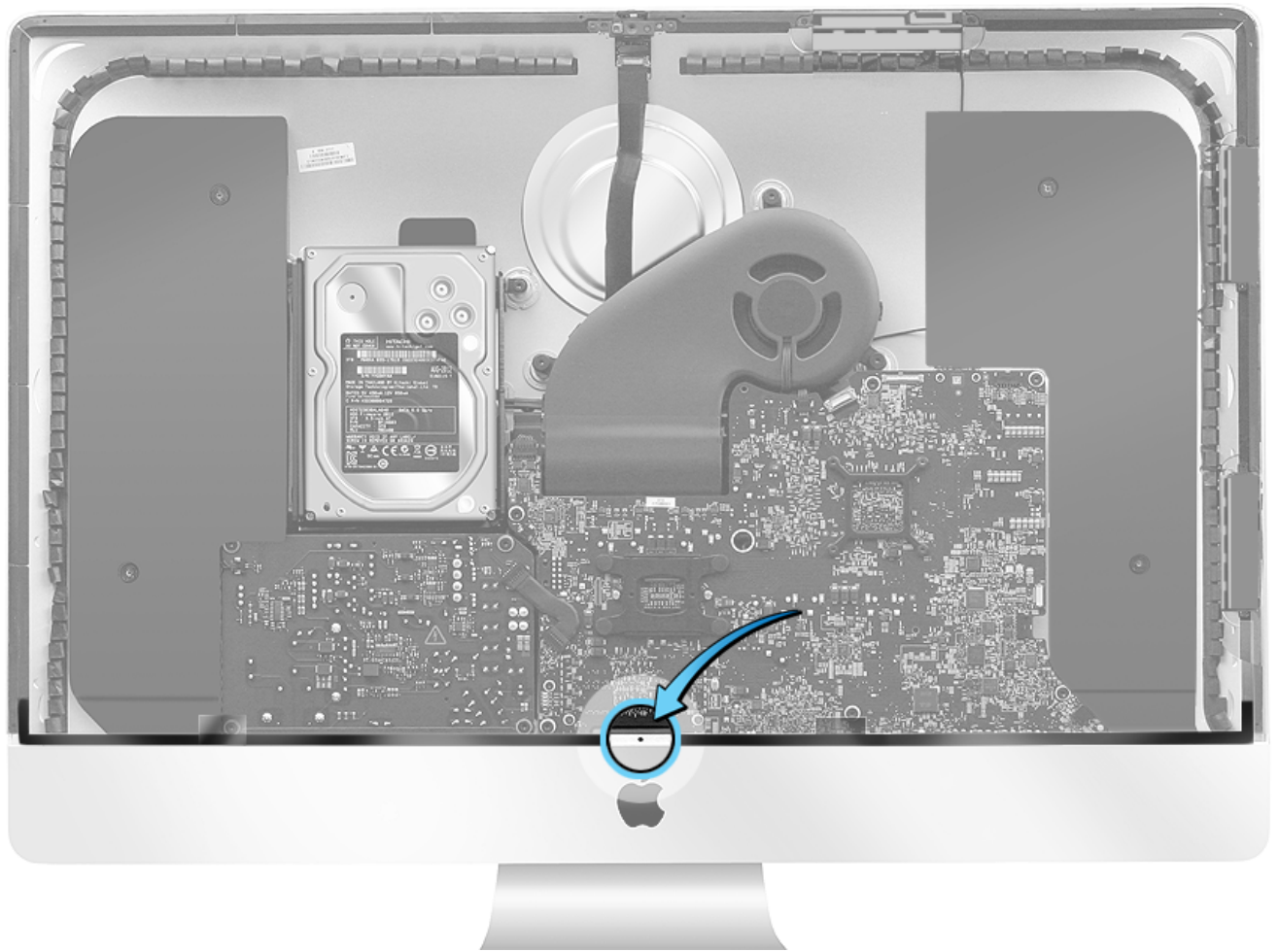
10. Insert the pointed end of a black stick into another alignment hole and peel the paper backing off of the strip. Press down with your finger to adhere the strip to the rear housing.



11. Repeat the VHB process (align, peel paper liners, press VHB into place) along the top edge of the rear housing. Press with your fingers to adhere the strips to the rear housing.



12. Start in the center of the chin (the bottom edge) and position the VHB strips to the left and right of the center screw hole as shown. The angled end of the VHB strip should attach to the rear housing, and should not overlap the VHB strips on the sides.



13. **Note:** If any VHB strip does not line up correctly, then remove it, clean the rear housing, and start again. Check that there are no wrinkles or exposed sections on the strip. Damage can cause cosmetic gap issues and may make the display bond weaker or create light leakage.

14. To install the display panel, refer to [RP1000: Display Panel Reassembly](#).

Display Panel Reassembly

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV117: Display Panel Replacement Video](#).

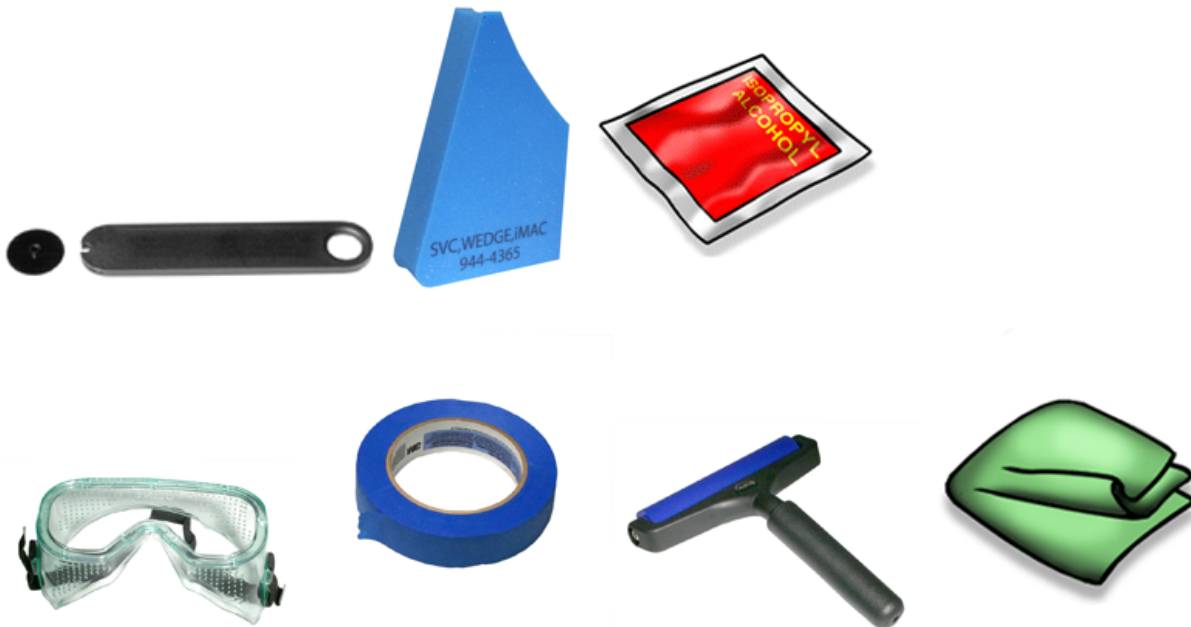
Before you begin:

- [Display Panel Removal](#)
- [Display Panel - Removing Very High Bond \(VHB\) Strips](#)
- [Display Panel - Replacing Very High Bond \(VHB\) Strips](#)



Tools

- Display removal tool
- Service wedge (iMac)
- Isopropyl alcohol (IPA) wipes (to remove residual VHB adhesive)
- Safety glasses
- Painter's tape (tape that does not leave a residue, 1 to 2 inches wide, preferably 2 inches, if available)
- Silicone display roller
- Clean, damp, lint-free cloth (to clean display panel glass)



Steps For Removal

This is a reassembly instruction article. For removal steps, refer to the following articles:

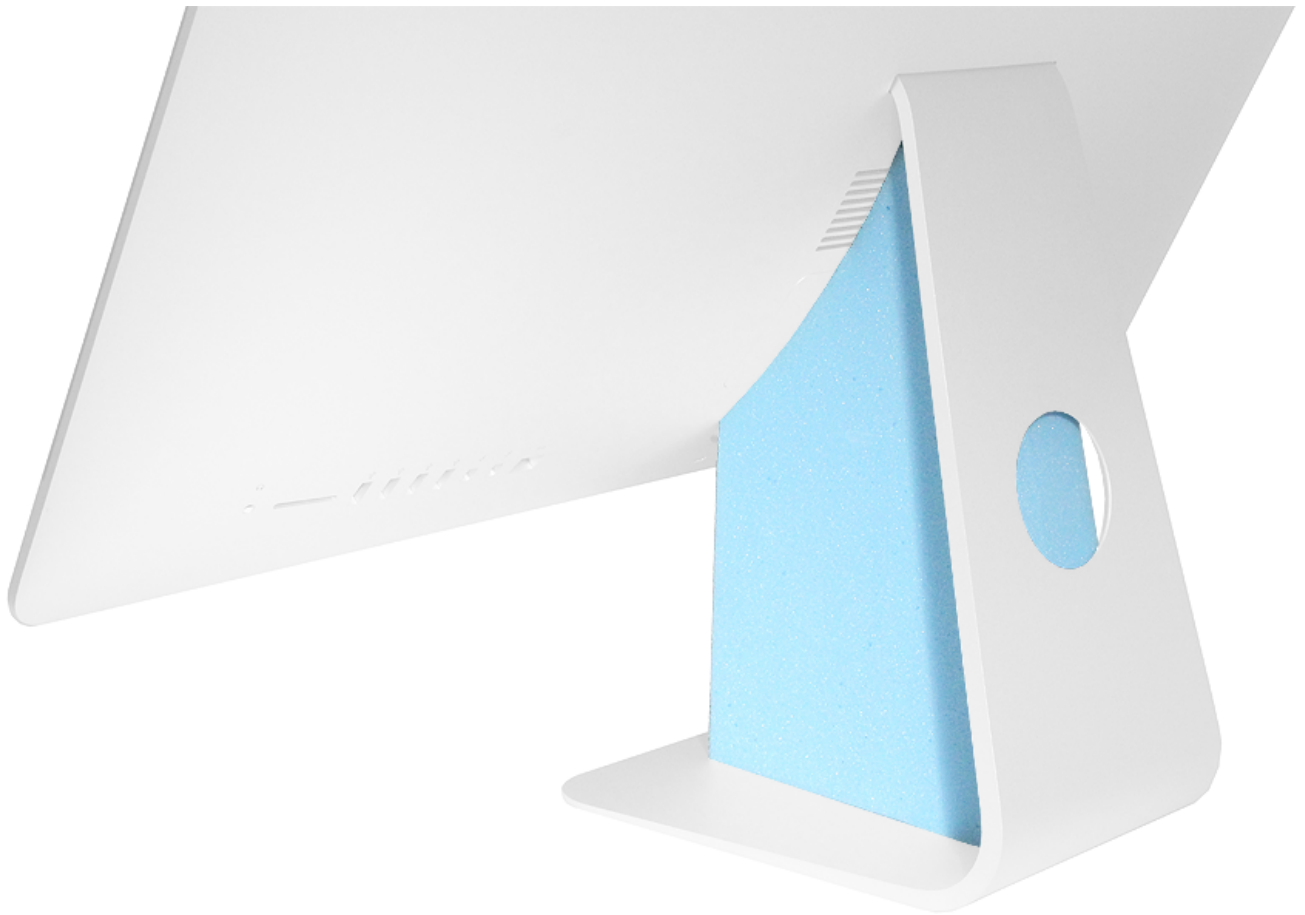
- [RP950: Display Panel Removal](#)
- [RP998: Display Panel - Removing Very High Bond \(VHB\) Strips](#)
- [RP999: Display Panel - Replacing Very High Bond \(VHB\) Strips](#)

If you have already performed the tasks listed above, then proceed to the next step.

Steps For Reassembly

Important: In the unlikely event that the display glass cracks or breaks, refer to article [TP819: Cleaning and Handling a Broken Display Panel](#).

1. Insert the service wedge to hold the display steady for this procedure. When positioned correctly, the wedge covers the power receptacle.



2. Before installing, ensure that any residual VHB is removed from the display panel and rear housing.



3. Place the display panel on the chin of the rear housing. Align the panel and check that it is centered and seated.



4. Use the display removal tool to check the alignment on both sides of the display. Adjust if necessary.



5. Anchor the display with a strip of painter's tape. Place it over the bottom of the display and the edge of the rear housing.



6. Stand back to check the alignment of the display panel. If the rear housing can be seen, then adjust the panel and check again.

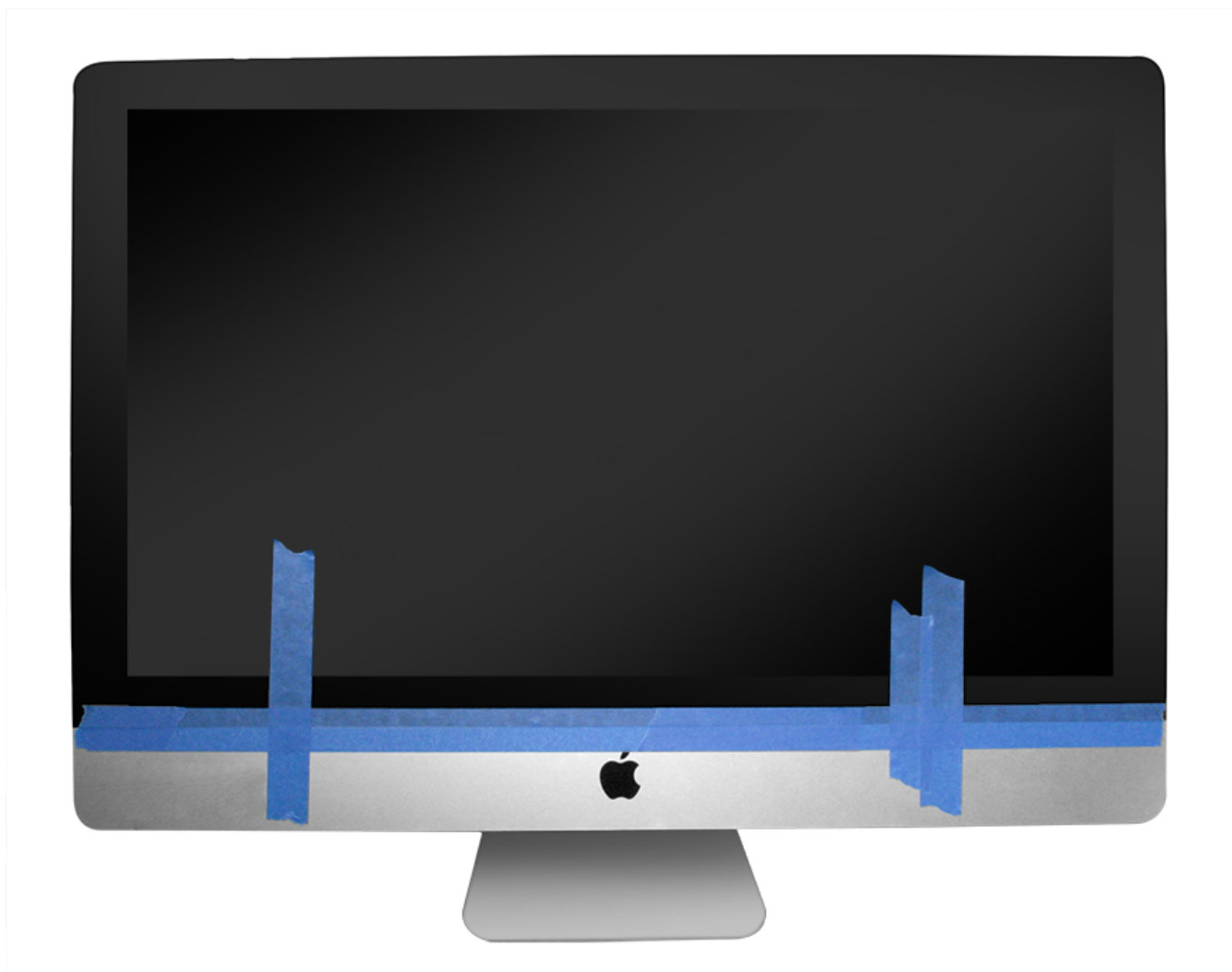
Incorrect alignment



Correct alignment



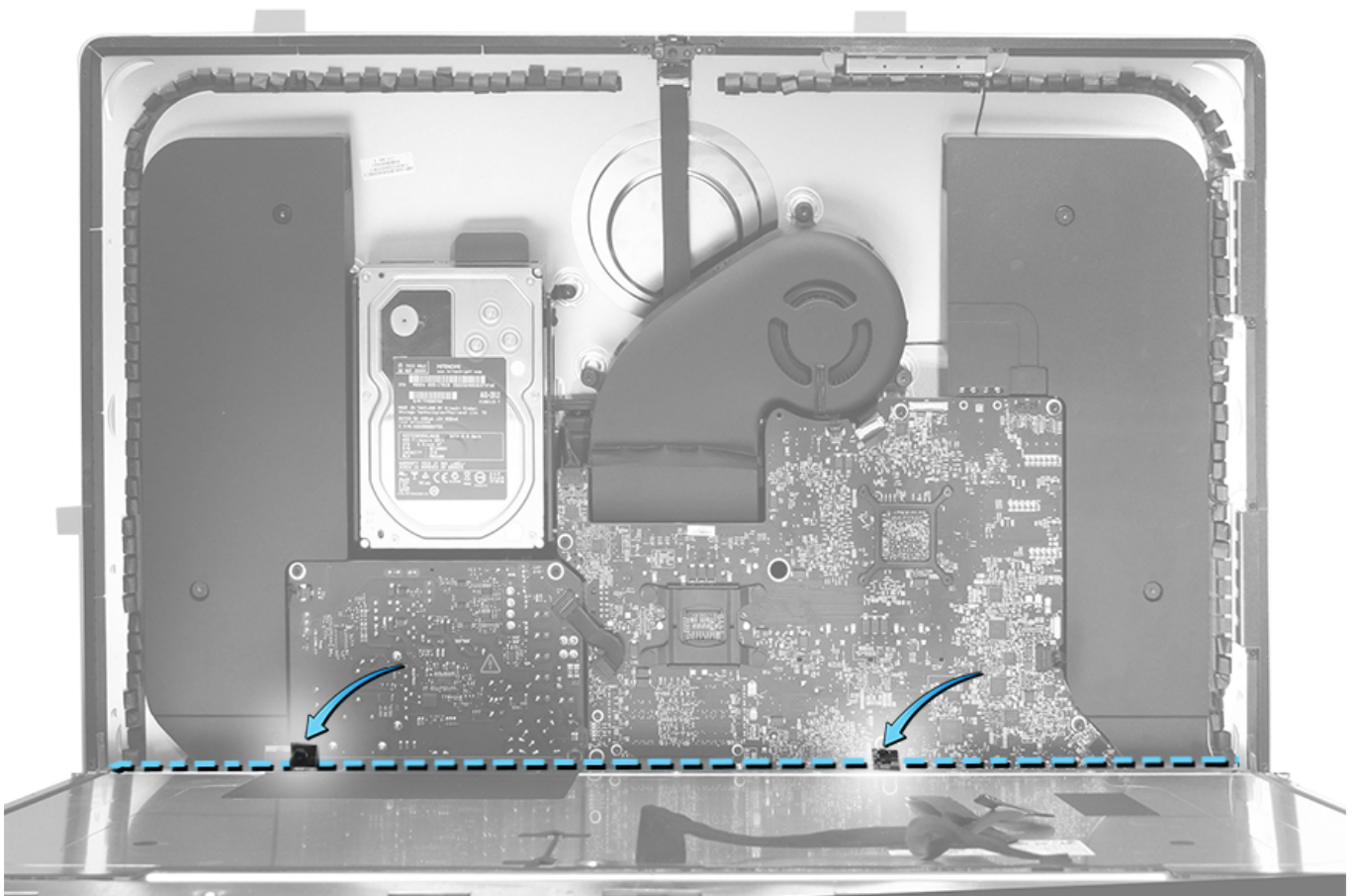
7. Anchor the display further with more strips of painter's tape. Place one or two vertical pieces along the edge for added support.



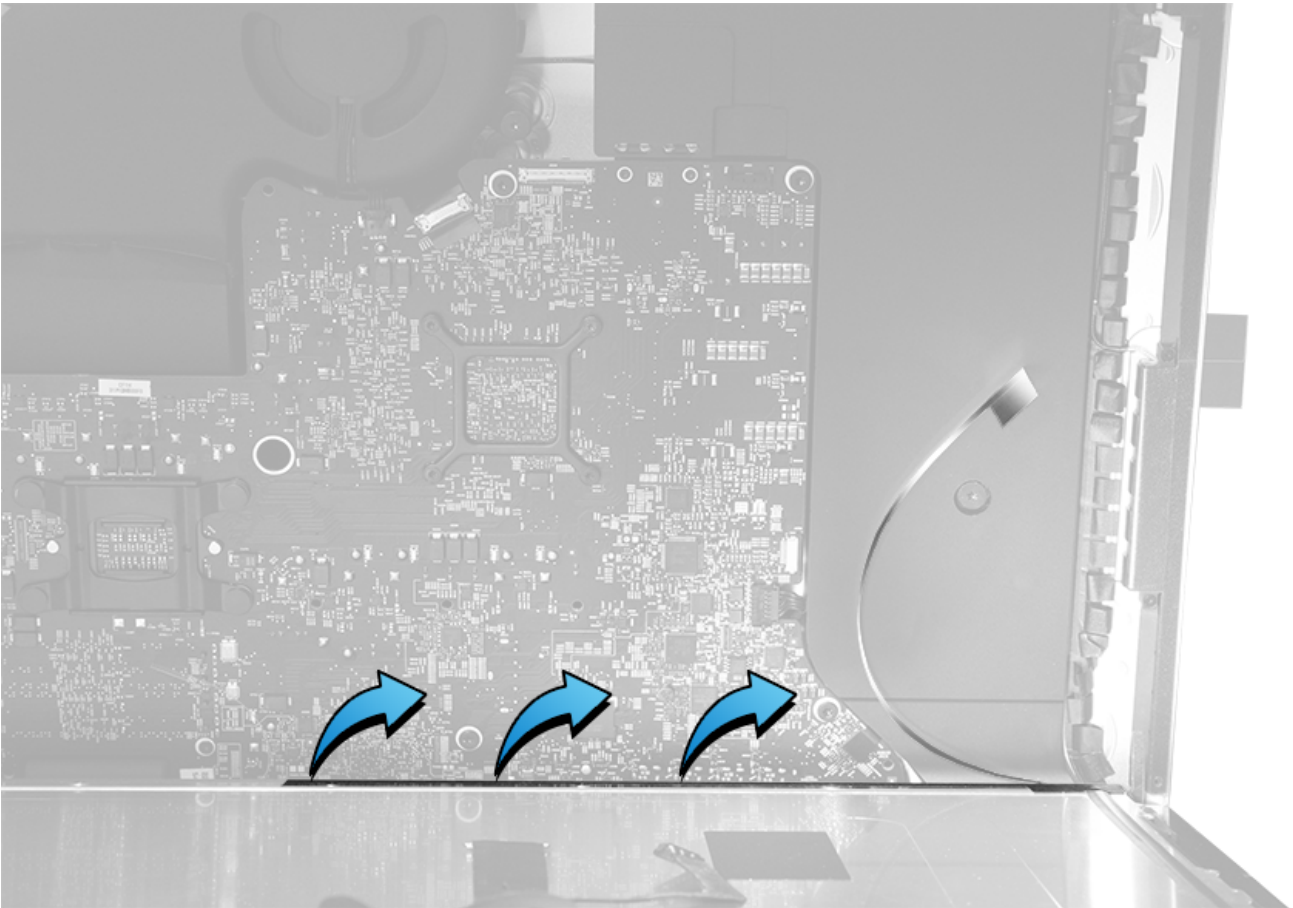
8. Use one hand to tilt the display forward.



9. Use the other hand to pull the clear release liners on the bottom VHB strips. Pull the release liners carefully so they do not tear or break.

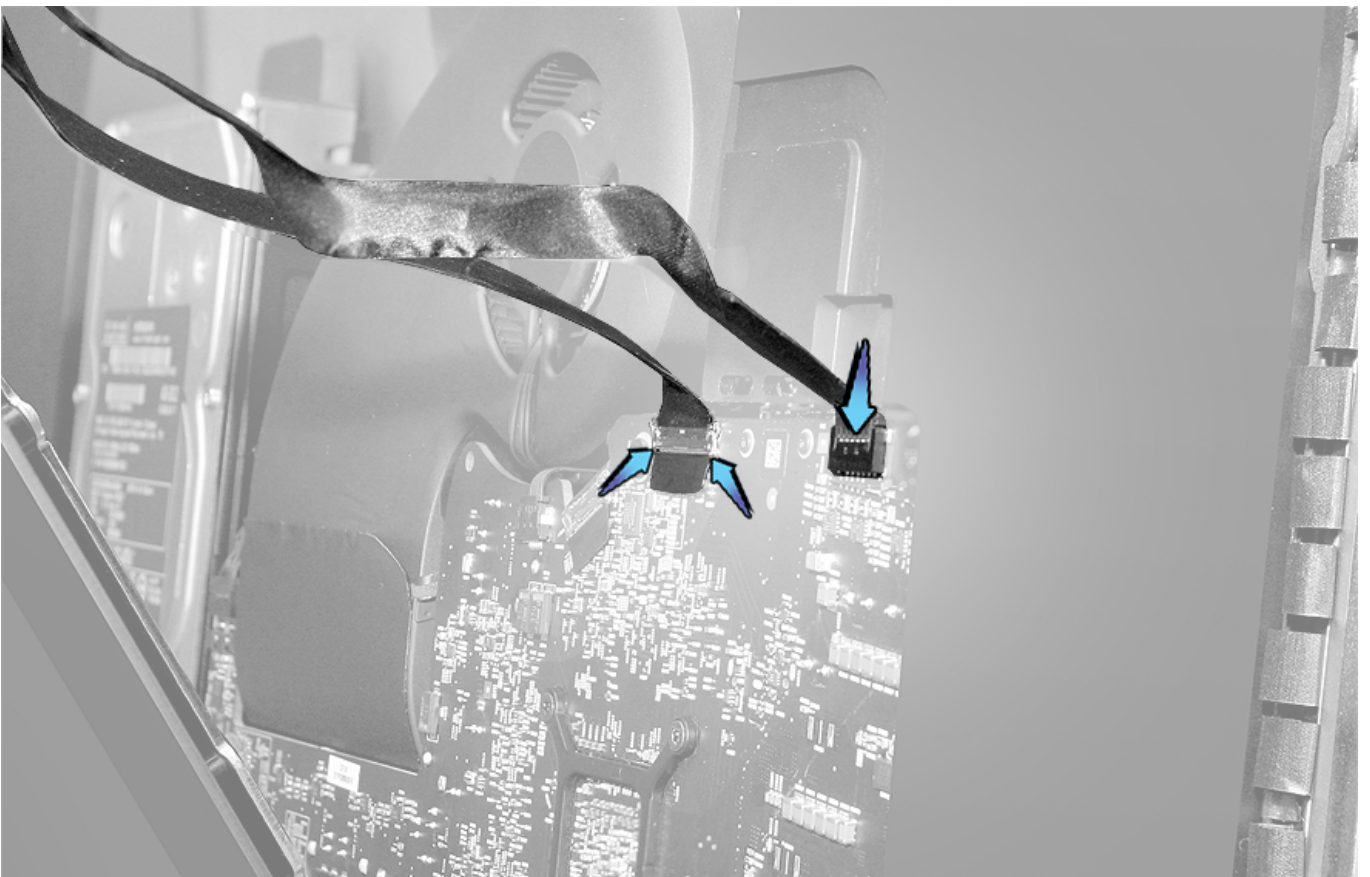


A closer view of the bottom release liner:

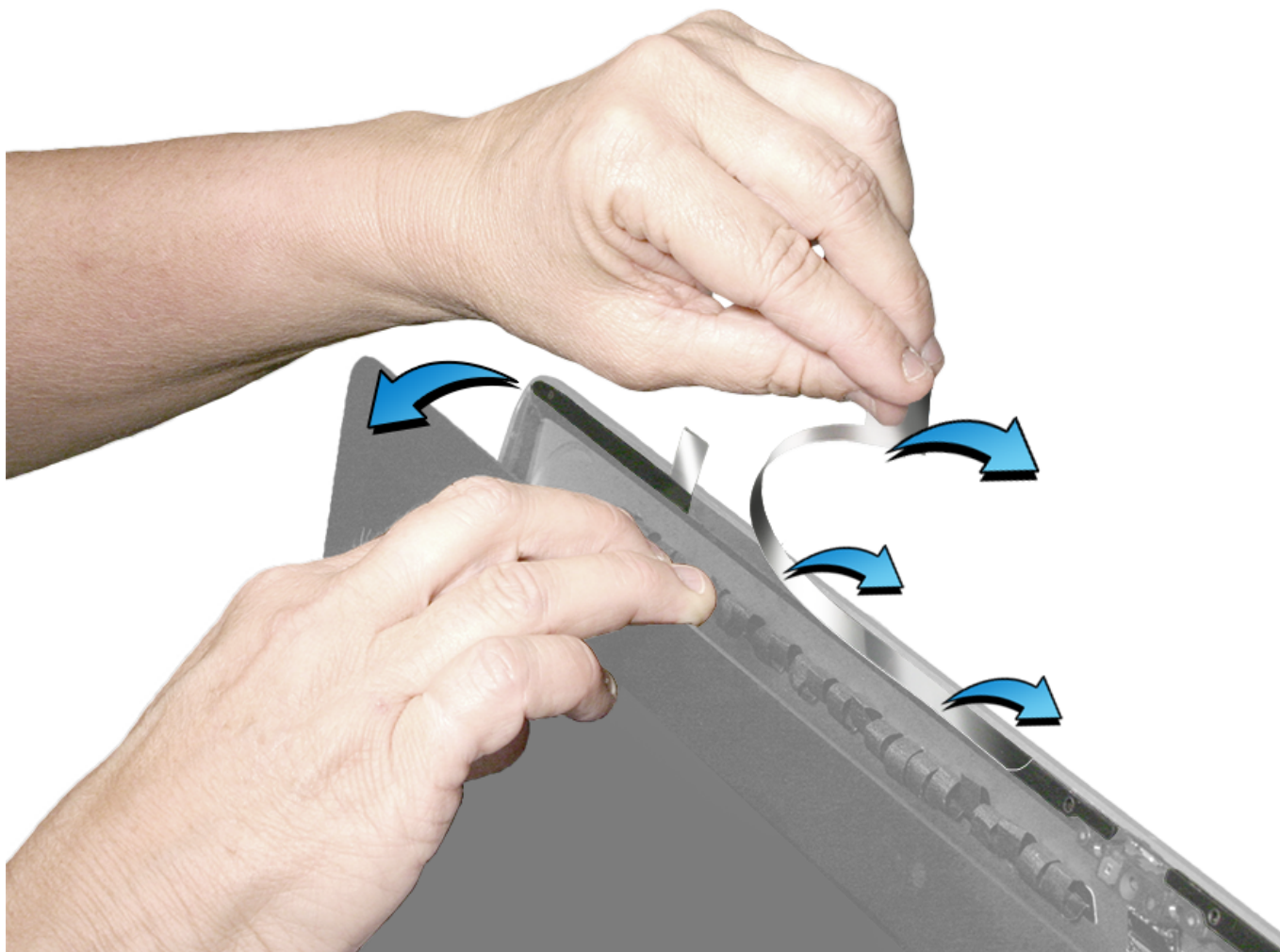


10. Tilt the display up, leaving enough room to connect the display power and Embedded DisplayPort (eDP) cables to the logic board. If these cables are not connected properly, it could result in no video or no power. Check that the connectors are firmly seated.

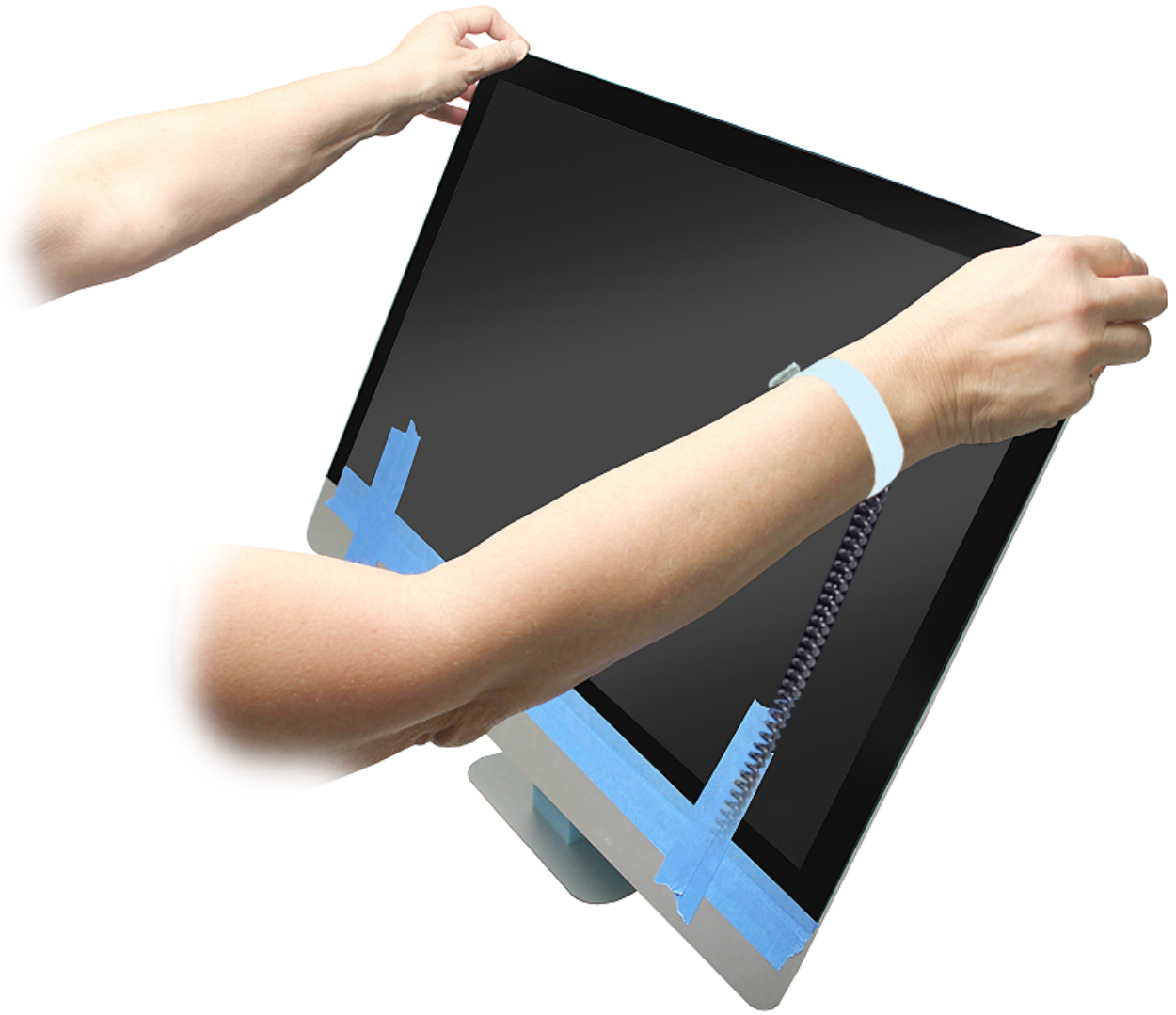
Important: Be extremely careful not to stress the display cables and connectors on the logic board when tilting the display open. The display connectors on the logic board are easily damaged. If the connectors are damaged, then the logic board will need to be replaced.



11. Remove the remaining release liners from the top and sides of the display panel.

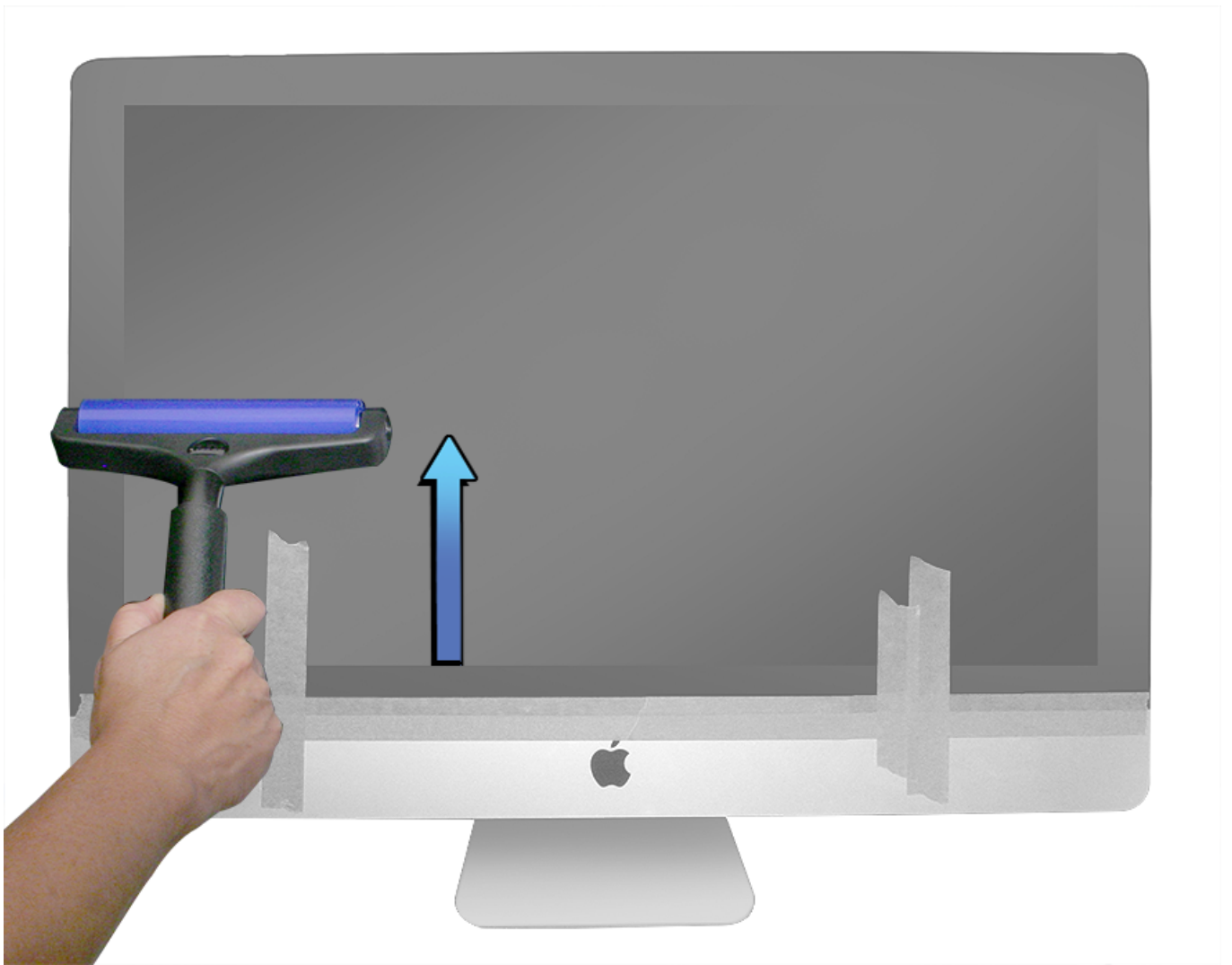


12. After all the release liners have been removed, lower the display panel against the rear housing.

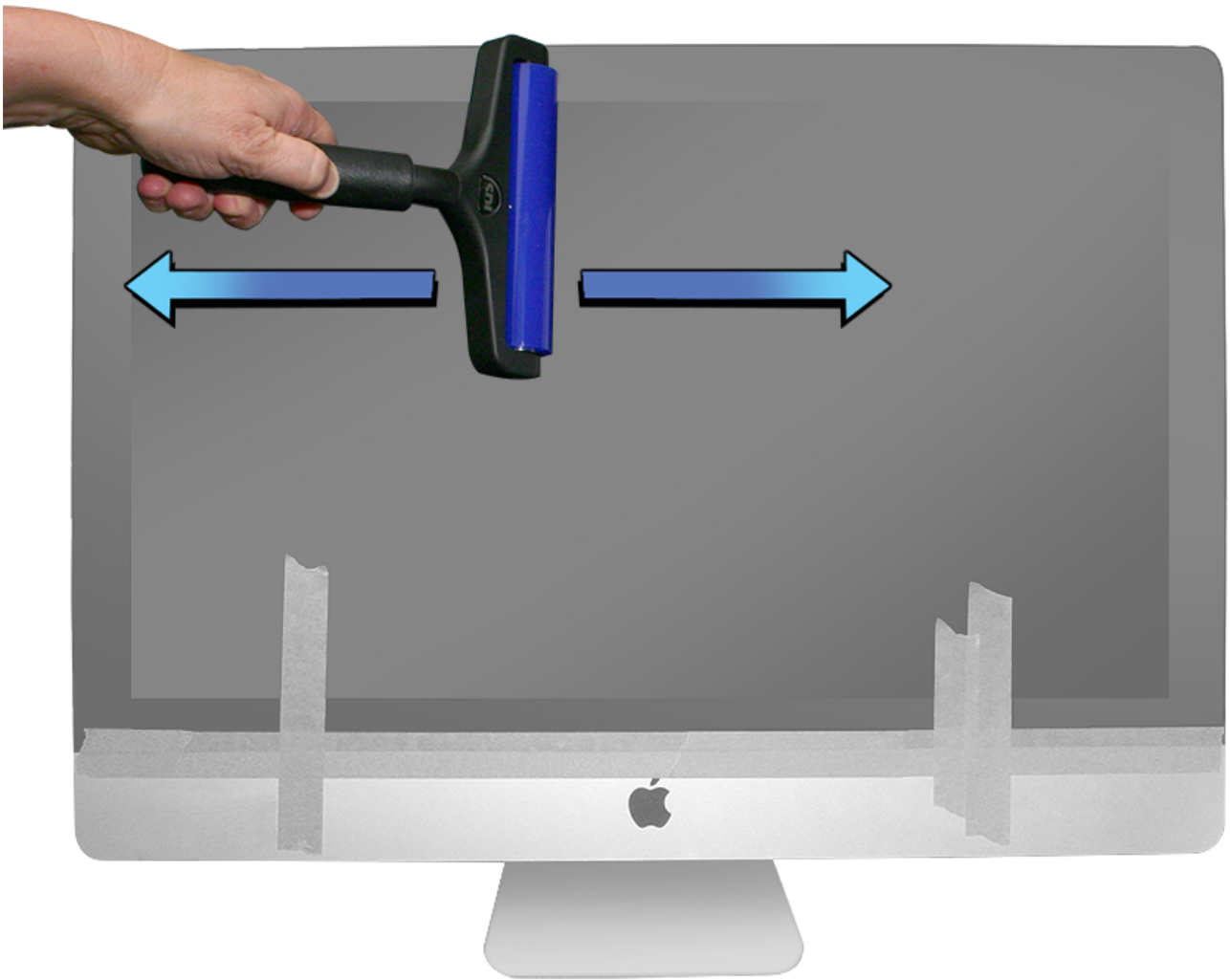


13. Use the silicone display roller to adhere the VHB strips to the glass. Roll the edges of the glass panel from the bottom to the top.

Note: Do not roll up and down.



Repeat the rolling along the top and the other side.



14. Remove the painter's tape.



15. Clean the front of the display with a clean, damp, lint-free cloth.

Note: Do not use IPA wipes to clean the display. IPA wipes should only be used to remove residual VHB adhesive.



Embedded DisplayPort Cable (eDP)

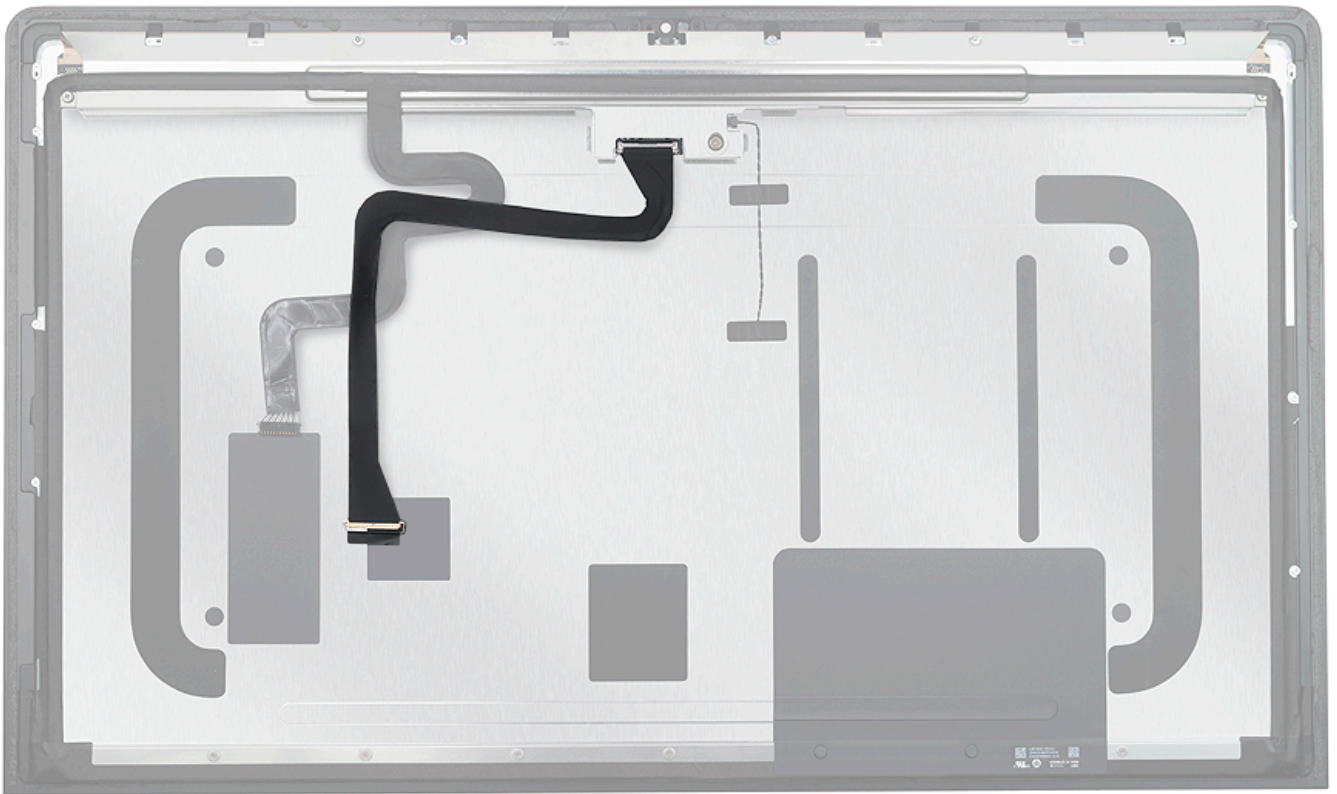
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: AppleCare Service Certifications](#).

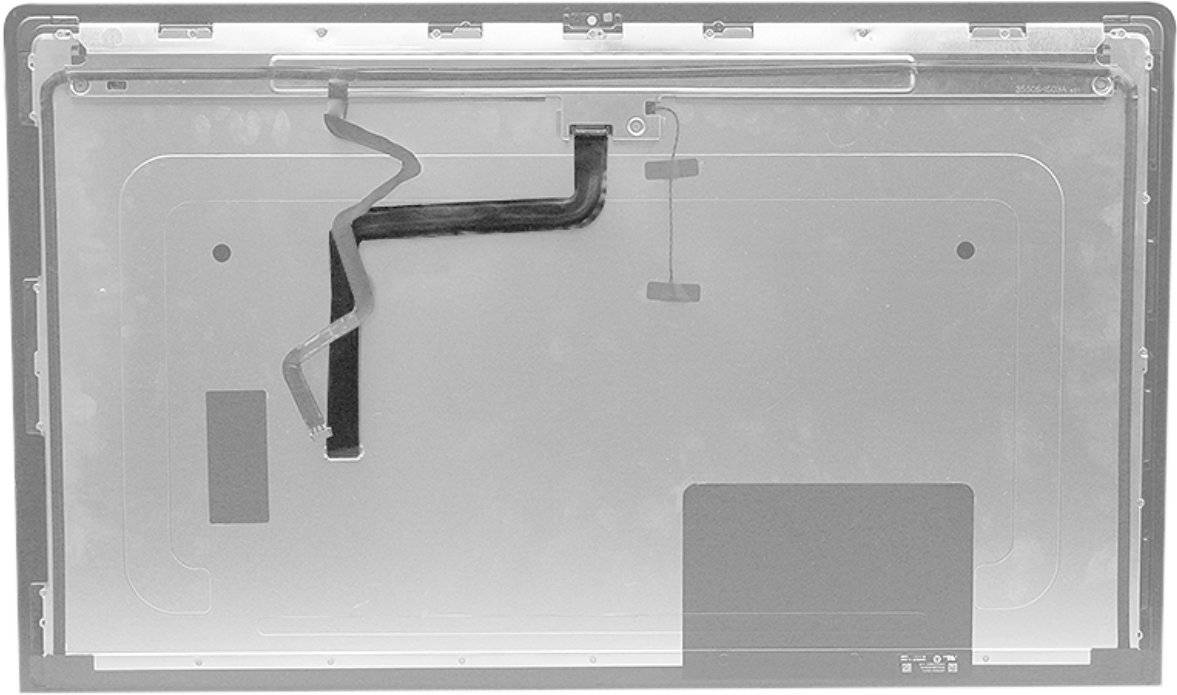
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)

iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

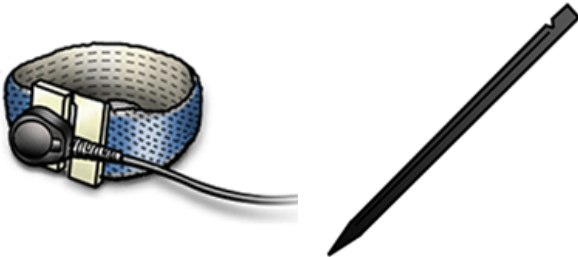


iMac (27-inch, Late 2012 and Late 2013)



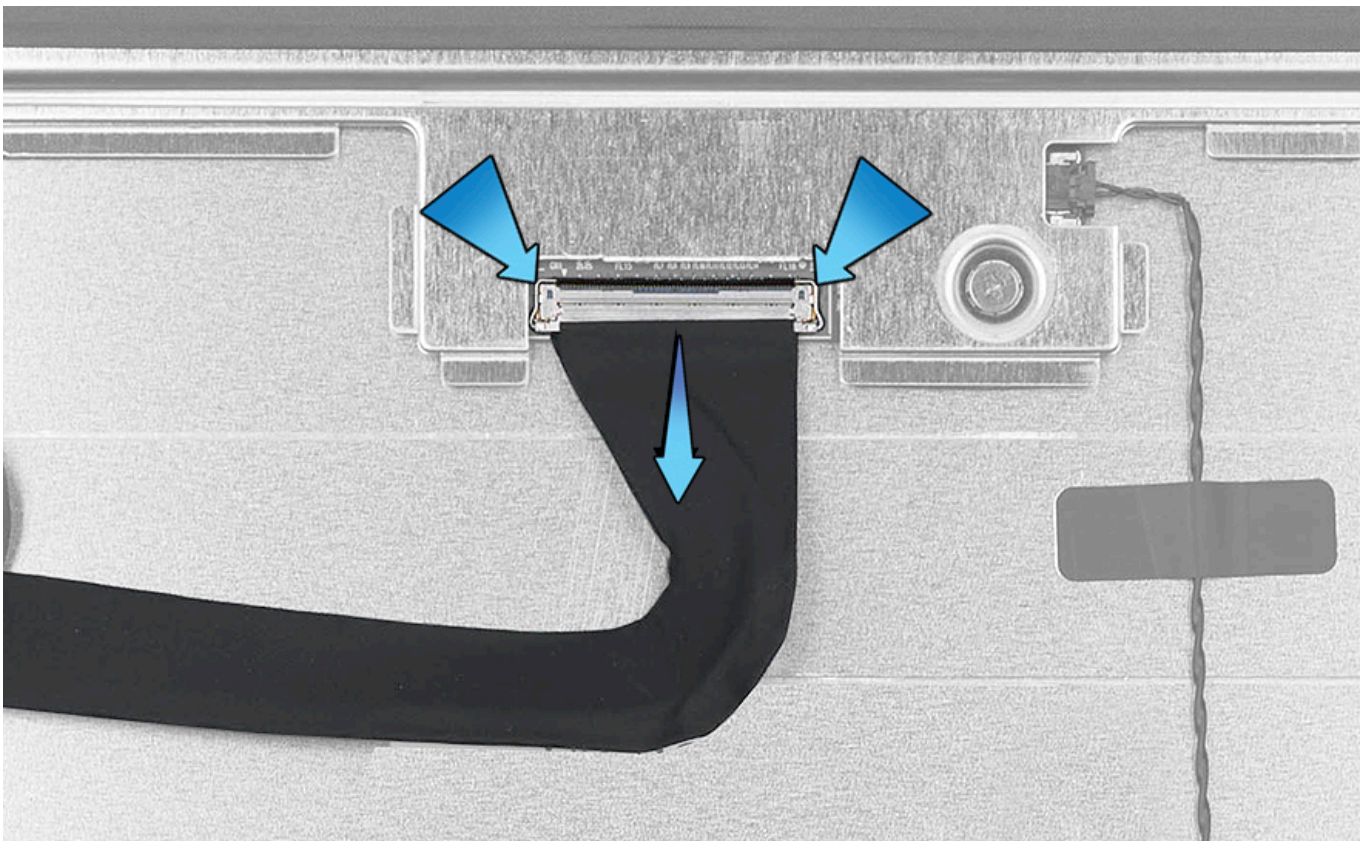
Tools

- ESD wrist strap and mat
- Black stick



Steps For Removal

1. Remove any tape that secures the Embedded DisplayPort (eDP) cable to the display panel.
2. Use a black stick to “unlock” the lock bar by gently flipping the bar toward the eDP cable.
3. Gently pull the eDP cable out of the connector.



Steps For Reassembly

1. If you are installing a new eDP cable, make sure to order the correct part number.

- 923-00093, eDP cable: iMac (Retina 5K, 27-inch, Late 2014) and iMac (Retina 5K, 27-inch, Mid 2015)
- 923-01087, eDP cable: iMac (Retina 5K, 27-inch, Late 2015)

Note: The iMac (Retina 5K, 27-inch, Late 2015) eDP cable can be identified by the pull tab on the cable. Remove the pull tab on the back of the cable to expose the adhesive before inserting the cable into the display panel connector.



2. Insert the eDP cable into its connector. Flip the lock bar up, ensuring that the cable is securely connected. Replace any tape that was covering the cable. **Important:** Press down around the lock bar to lock the lever into place. **Note:** On the iMac (Retina 5K, 27-inch, Late 2015), press on the area of the cable with the adhesive, to secure the cable to the display panel.

3. Install new [display panel VHB strips](#).

4. Reinstall the [display panel](#).

Display Thermal Sensor Cable

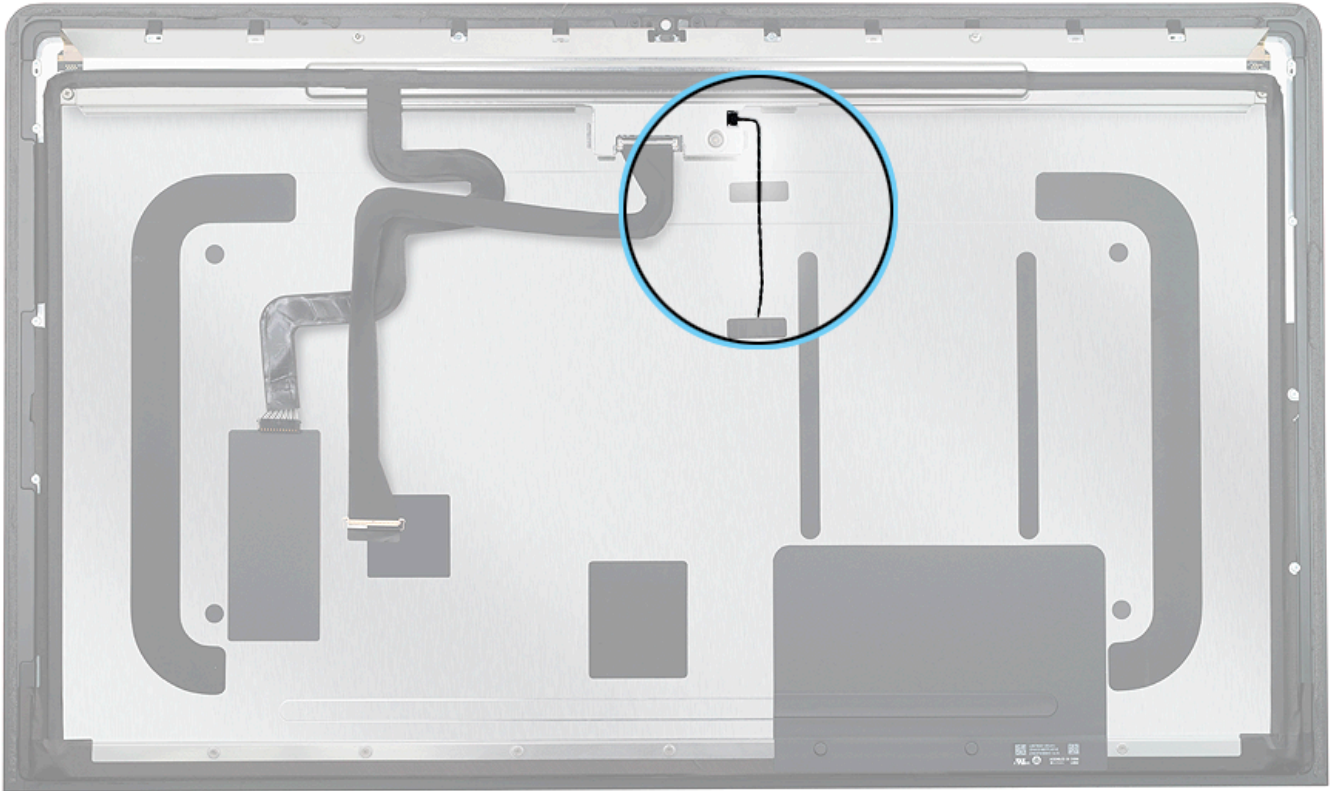
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

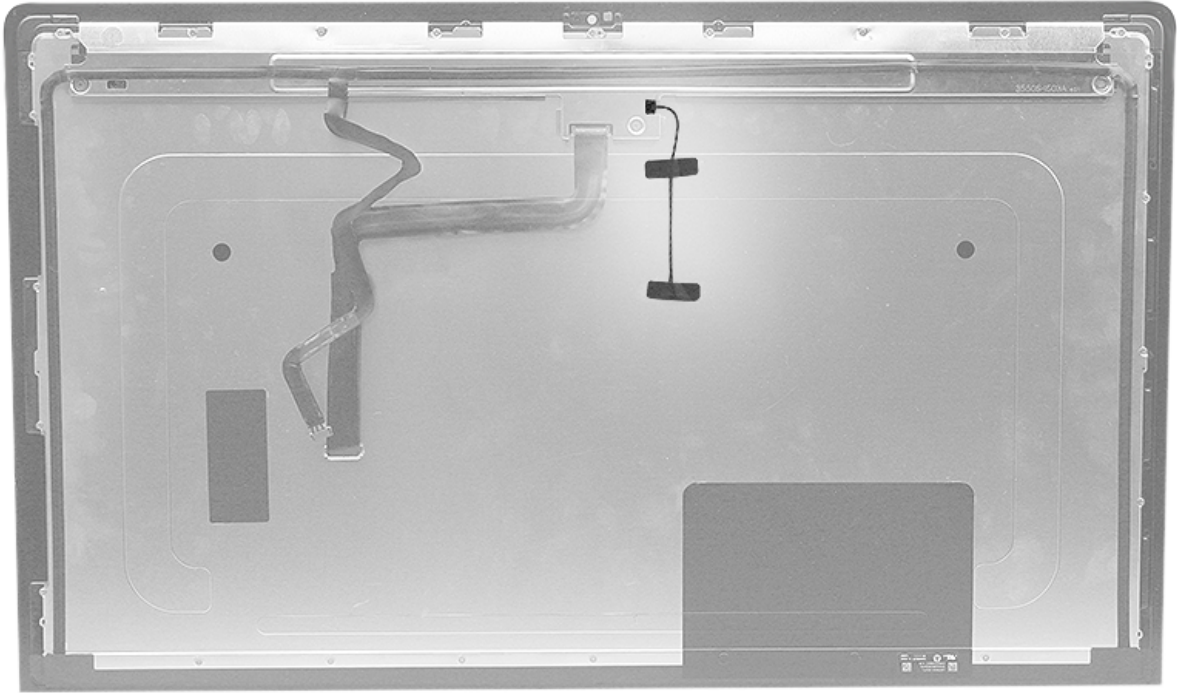
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)

iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

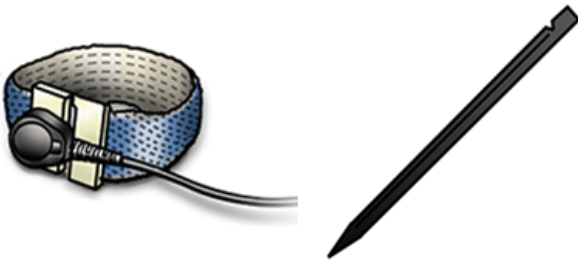


iMac (27-inch, Late 2012 and Late 2013)



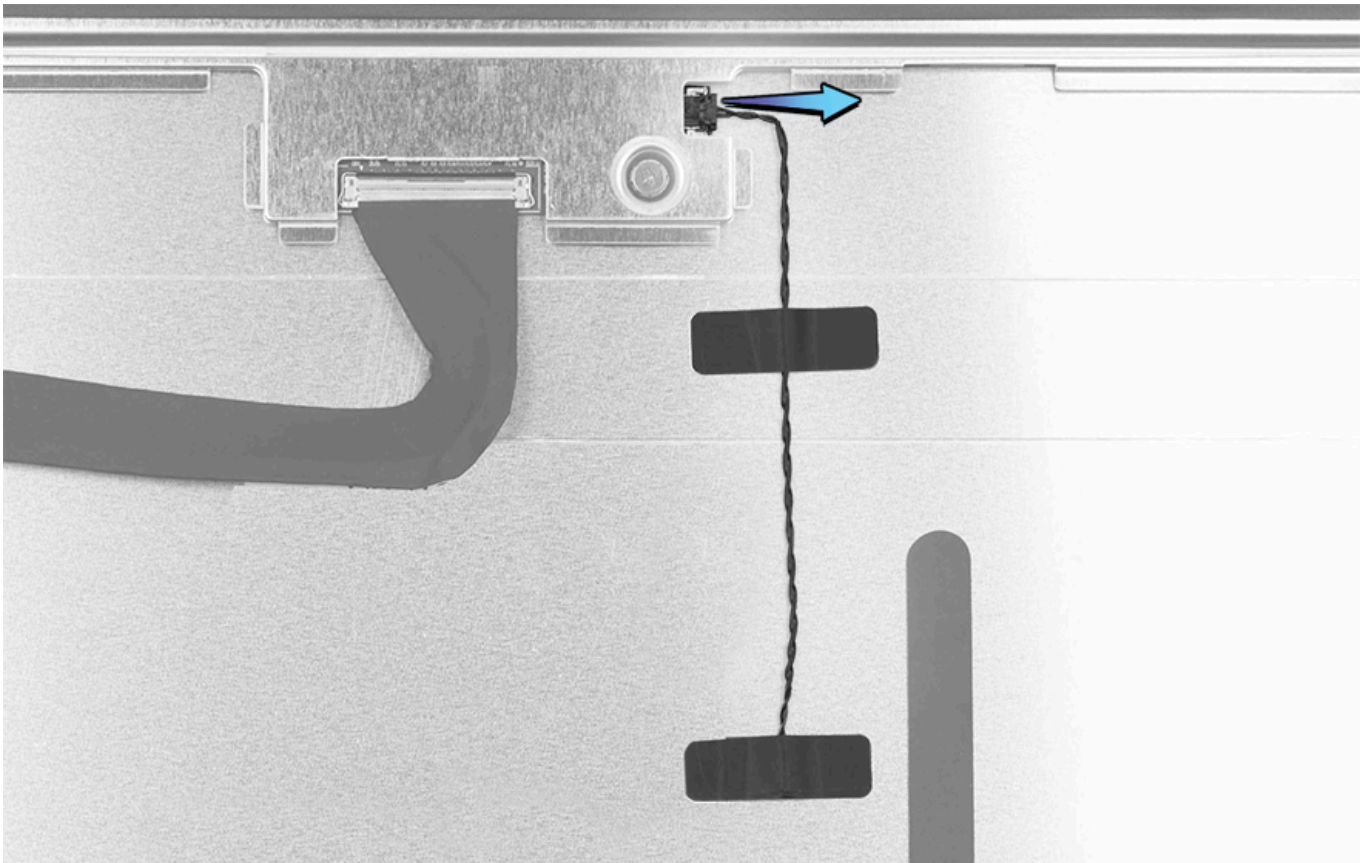
Tools

- ESD wrist strap and mat
- Black stick



Steps For Removal

1. Remove any tape that secures the display thermal sensor cable to the display panel.
2. Use the pointed end of a black stick to gently push the display thermal sensor cable out of its connector.
3. Remove the two pieces of tape that secure the thermal sensor cable to the display panel. Use a black stick to pry the square sensor board (located under the lower piece of tape) off of the display panel.



Steps For Reassembly

1. If you are installing a replacement thermal sensor cable, then peel the backing off of the sensor board and stick the sensor to the back of the display panel. If you are reinstalling the original thermal sensor cable, then press the sensor board onto the back of the display panel.
2. Insert the cable into its connector.
3. Secure the cable with tape.
4. Install new [display panel VHB strips](#).
5. Reinstall the [display panel](#).

Fan

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: About AppleCare service certifications](#).

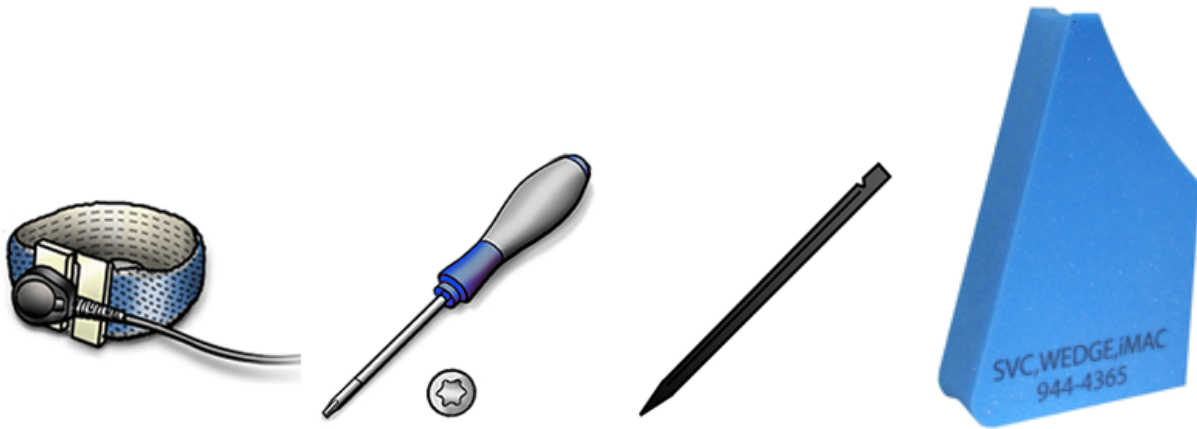
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)



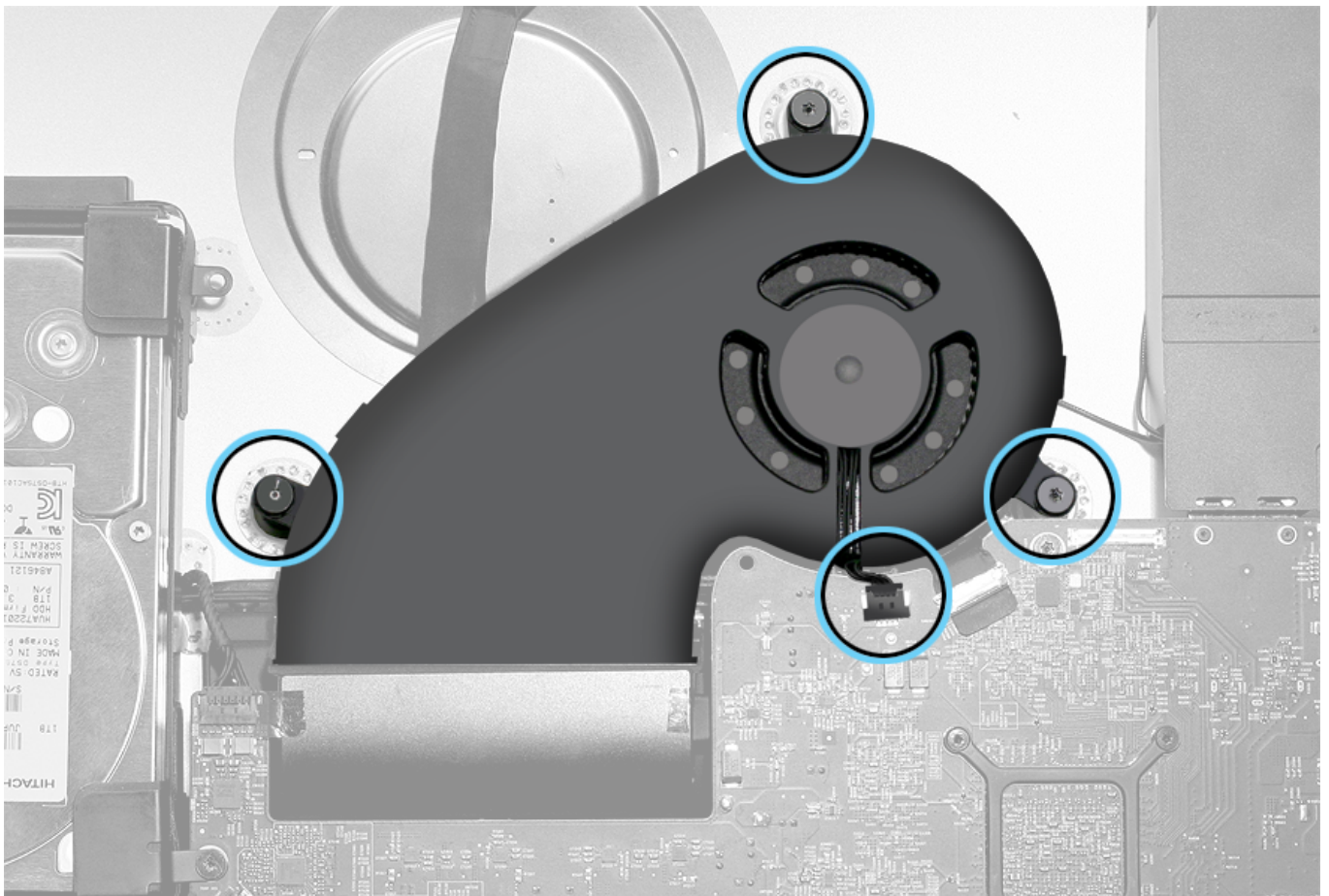
Tools

- ESD wrist strap and mat
- Torx T10 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)

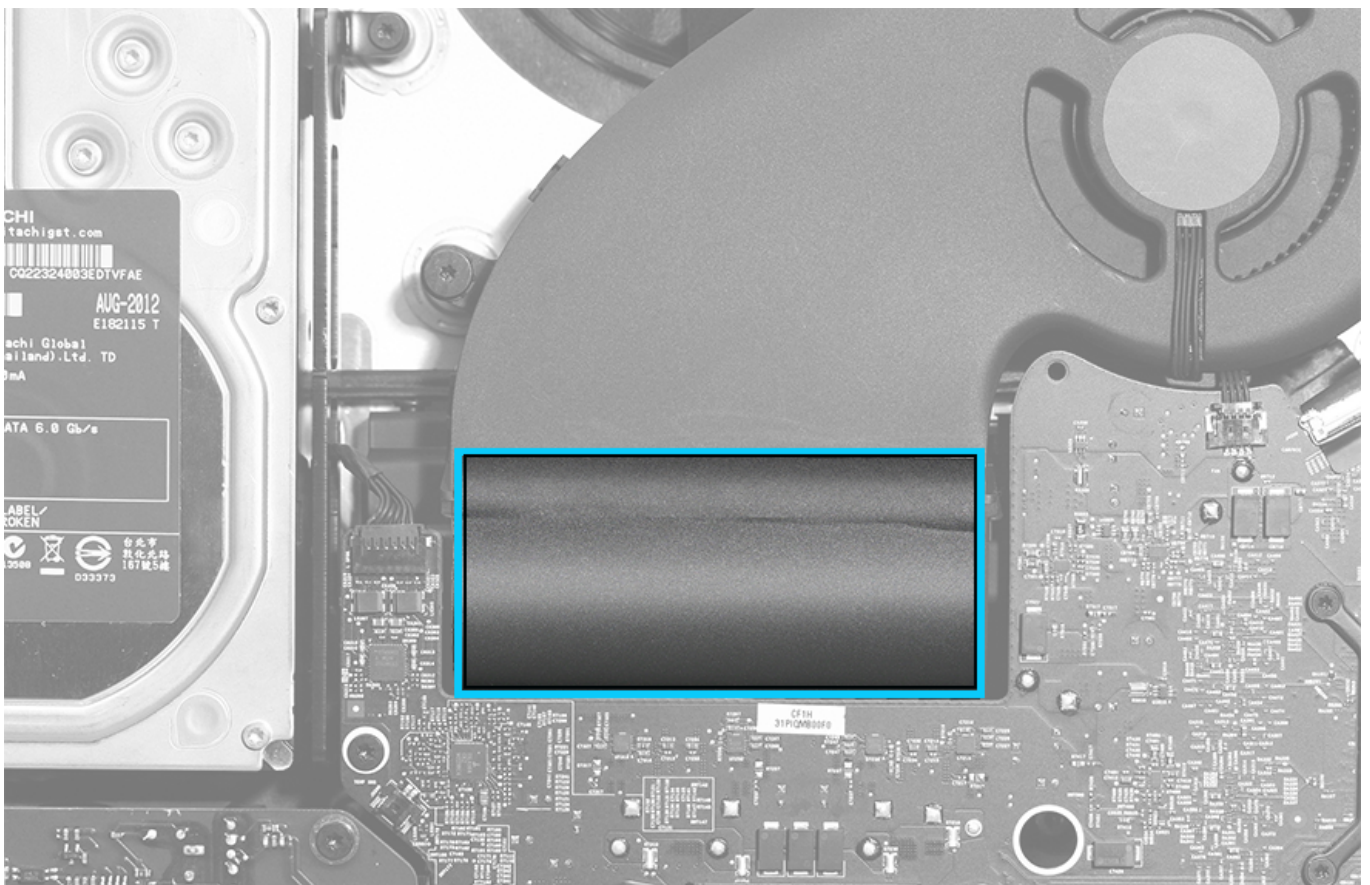


Steps For Removal

1. Use a black stick to disconnect the fan cable from the logic board.
2. Remove three 12.3 mm T10 screws (923-00669) from the fan.



3. Peel back the top edge of the black Mylar shield to loosen it from the fan.
 - If you will be reinstalling the original fan, keep the black Mylar shield attached.
 - If you will be installing a replacement fan, transfer the black Mylar shield to the new fan.

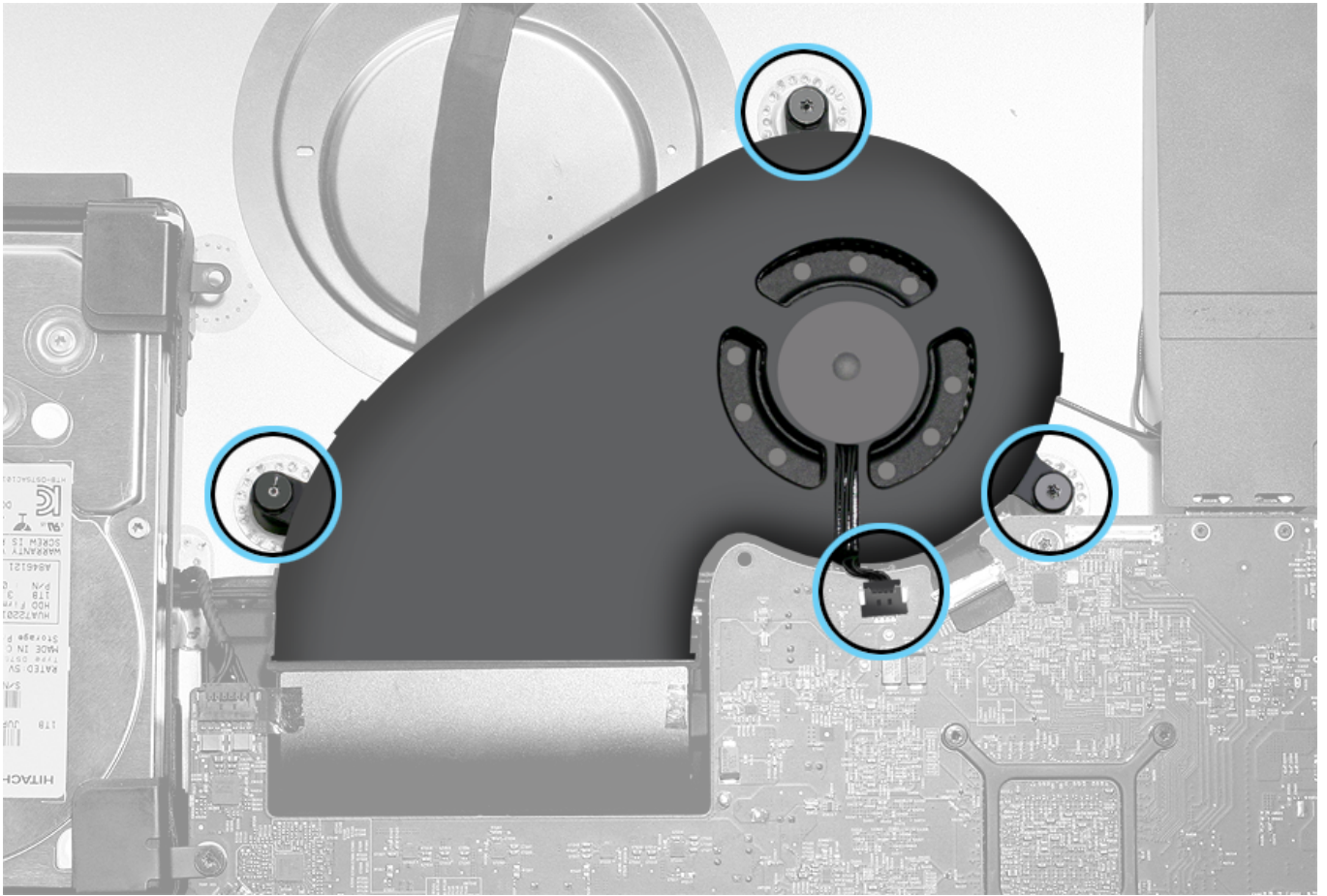


4. Tilt the fan out of the computer assembly.



Steps For Reassembly

1. Check that the fan cable routes through the hooks on the side of the fan.
2. Connect the fan cable to the logic board.
3. Install three 12.3 mm T10 screws (923-00669) to the fan.



4. Install new [display panel VHB strips](#).

5. Reinstall the [display panel](#).

Camera

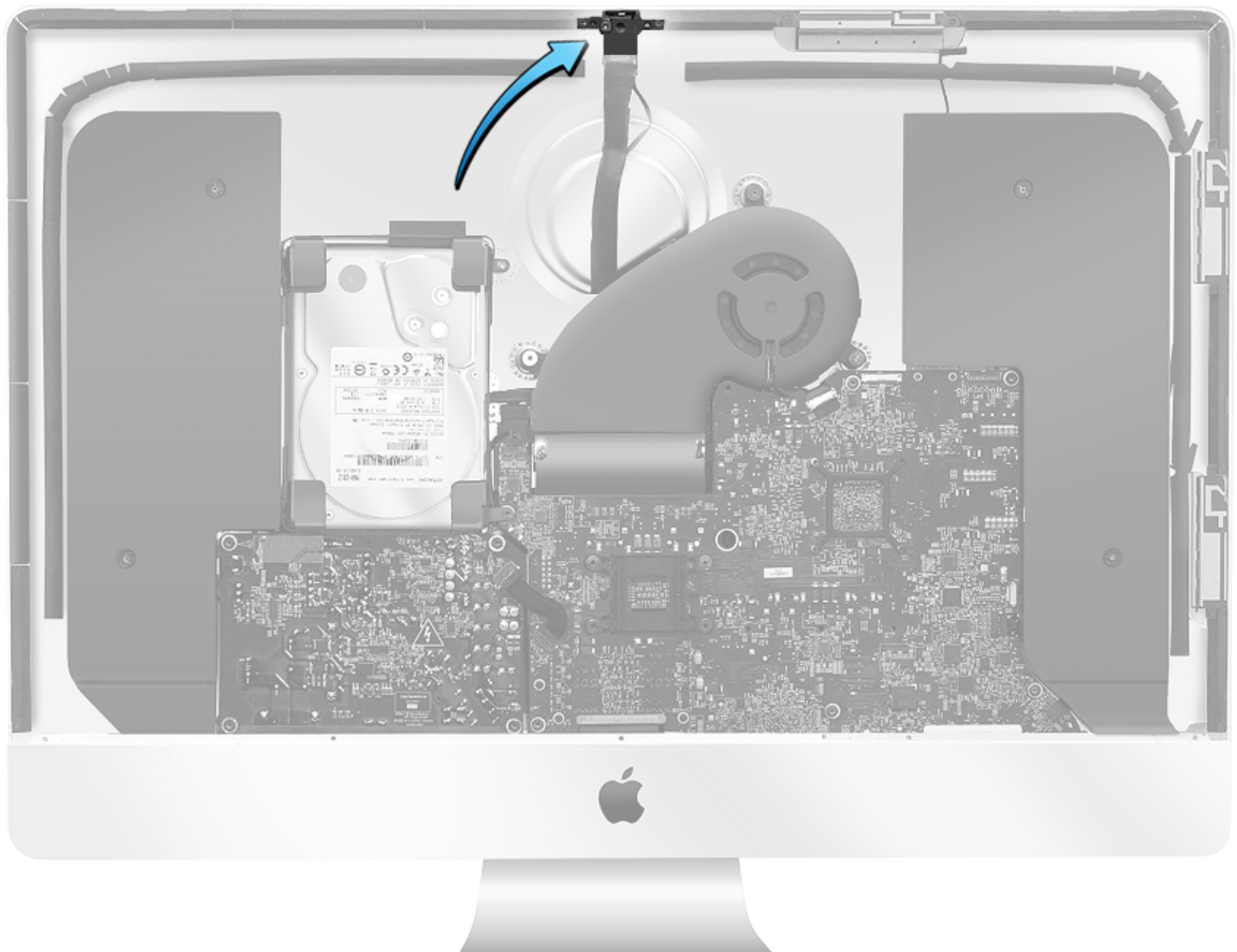
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV242: Camera Replacement Video](#).

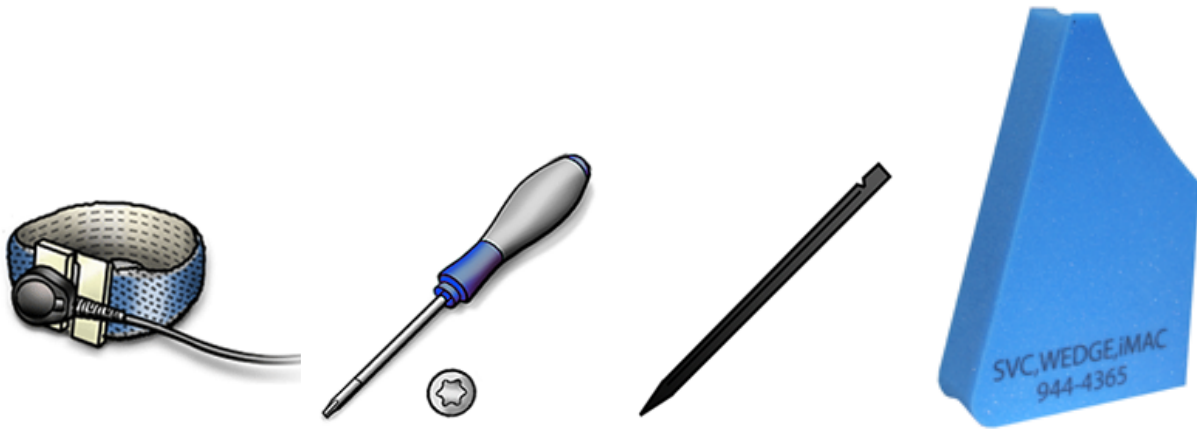
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)



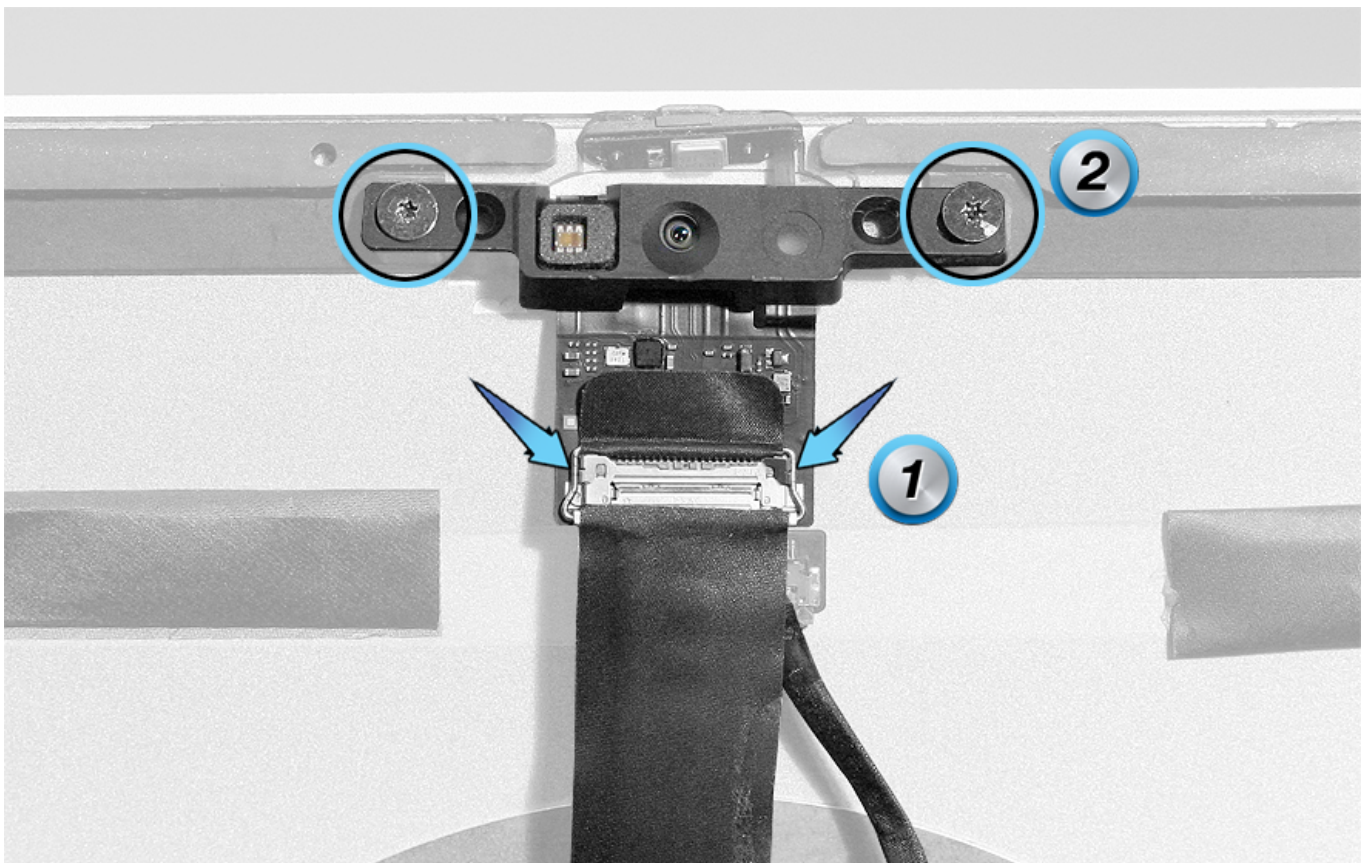
Tools

- ESD wrist strap and mat
- Torx T5 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)



Steps For Removal

1. Use a black stick to unlock the lock bar (#1) by gently flipping the bar over toward the cable. Gently pull the cable — not the lock bar — to disconnect the cable.
2. Remove two 3.96 mm T5 screws (923-0339) (#2) from the camera.



Steps For Reassembly

1. Install two 3.96 mm T5 screws (923-0339) on the camera. **Note:** If installing a replacement camera, then do not forget to remove the protective film covering the lens.
2. Carefully insert the camera cable into the connector. Check that the cable is firmly inserted into the connector.
3. Flip the lock bar up to the closed position. **Important:** Press around the edges of the lock bar to secure the camera cable.
4. Install new [display panel VHB strips](#).

5. Reinstall the [display panel](#).

Camera/Microphone Cable

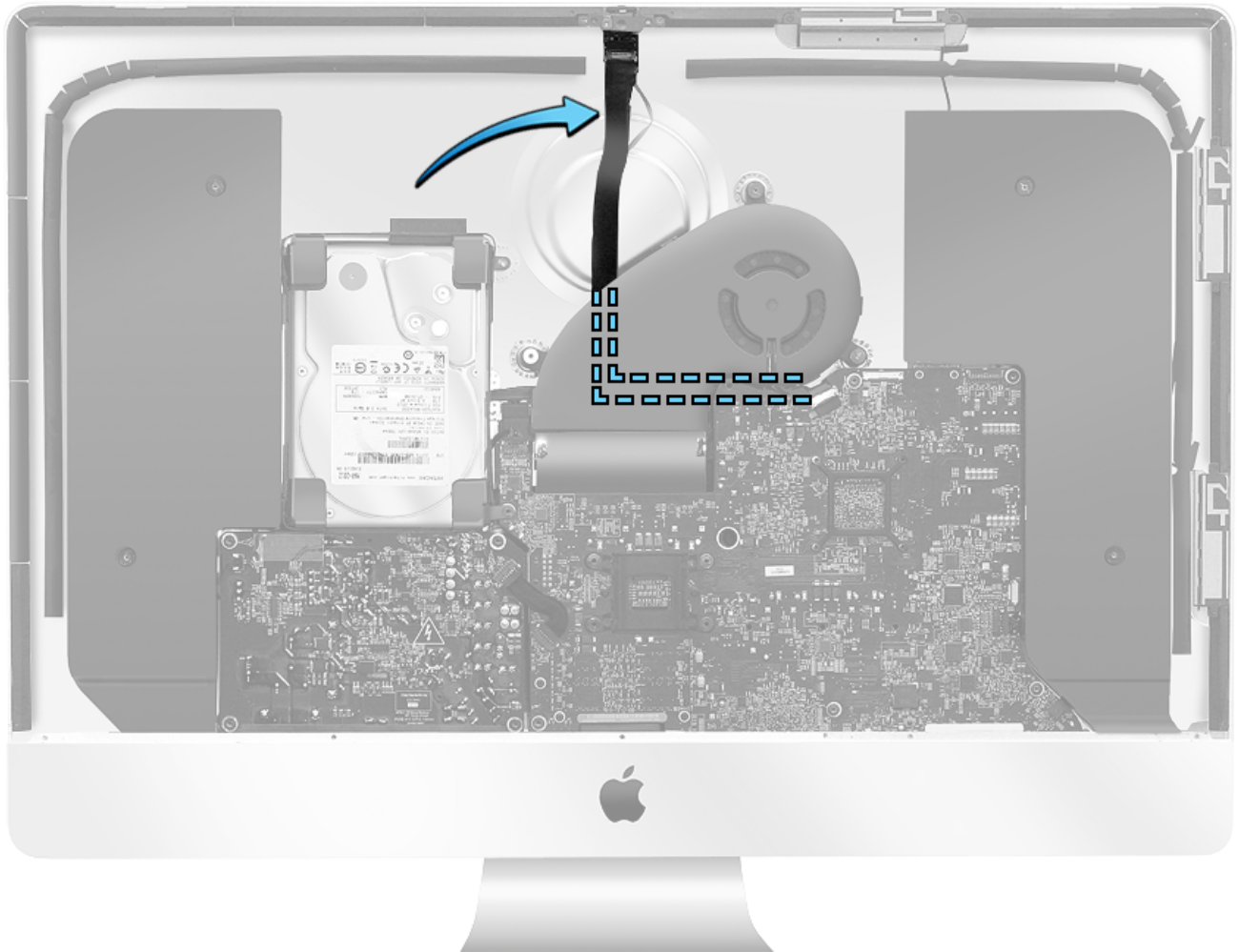
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV243: Camera/Microphone Cable Replacement Video](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)



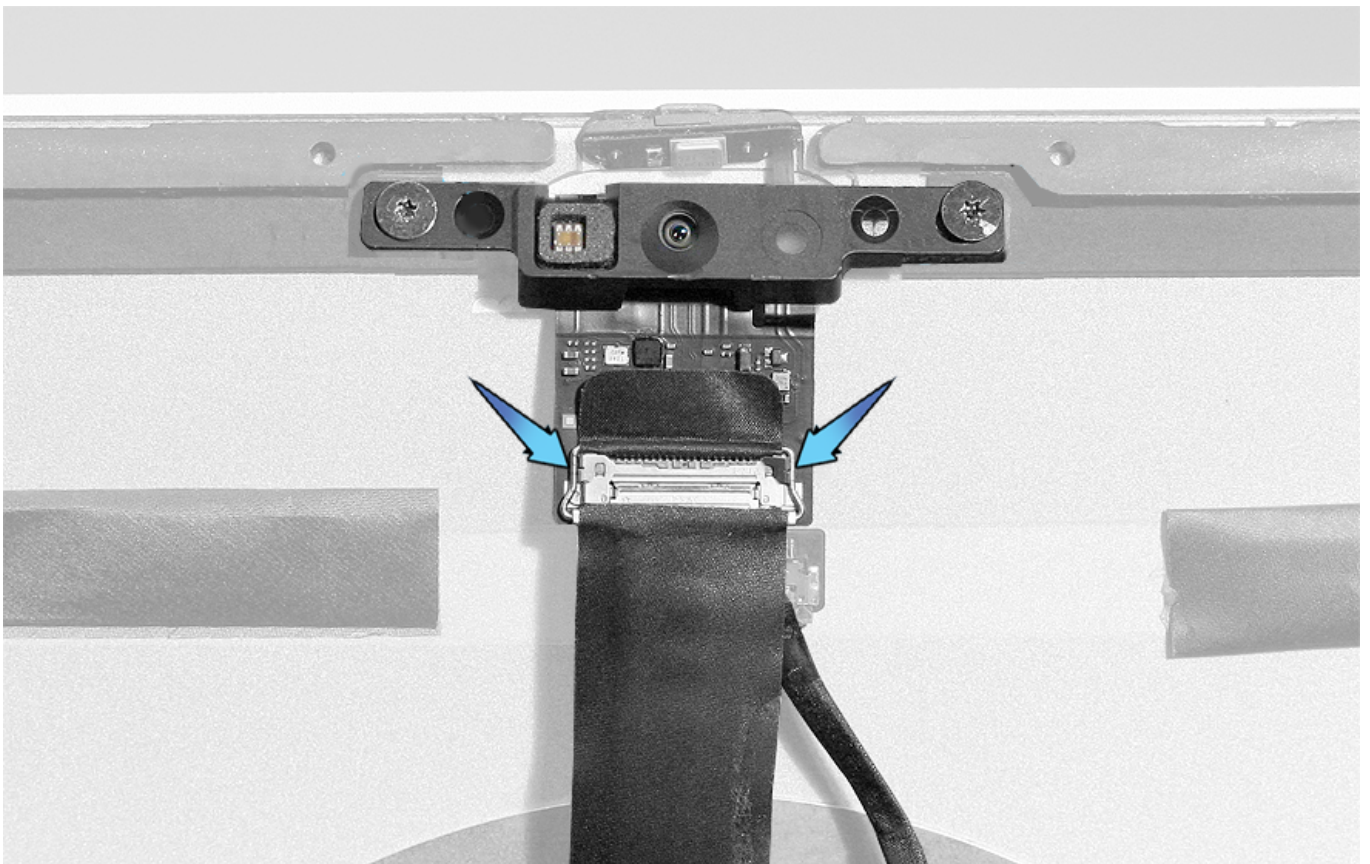
Tools

- ESD wrist strap and mat
- Black stick
- Service wedge (iMac)

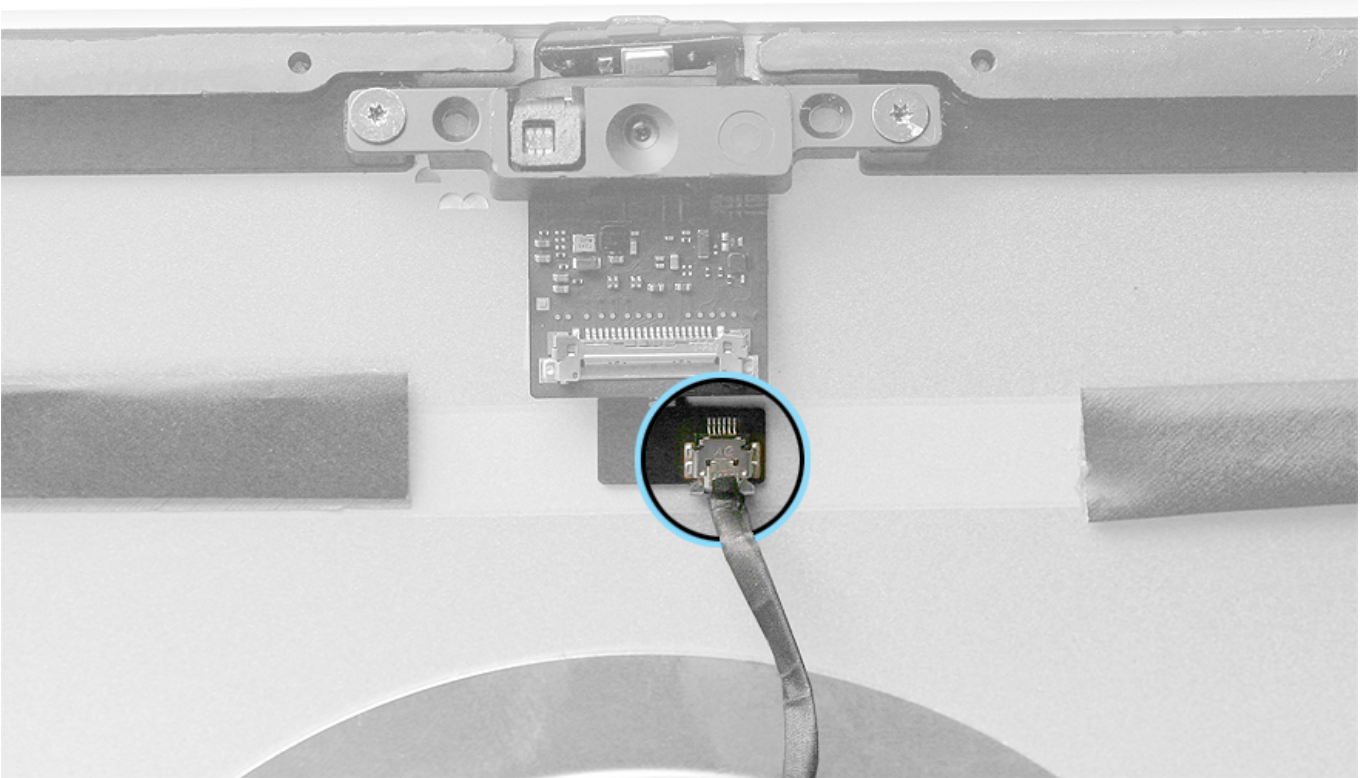


Steps For Removal

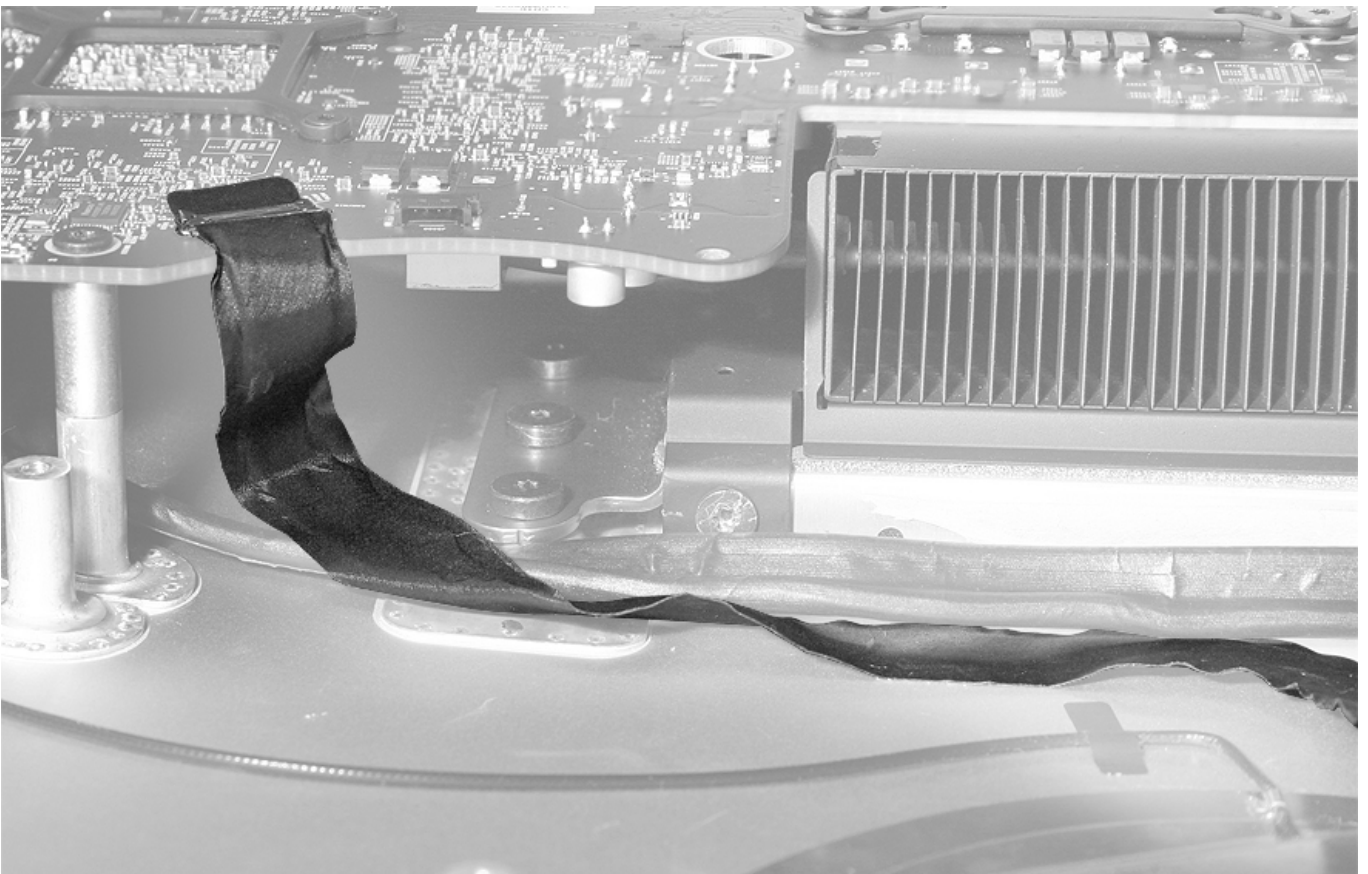
1. Use a black stick to "unlock" the lock bar by gently flipping the bar over toward the cable. Gently pull the cable — not the lock bar — to disconnect the cable.



2. Pull the microphone cable straight out of the connector.

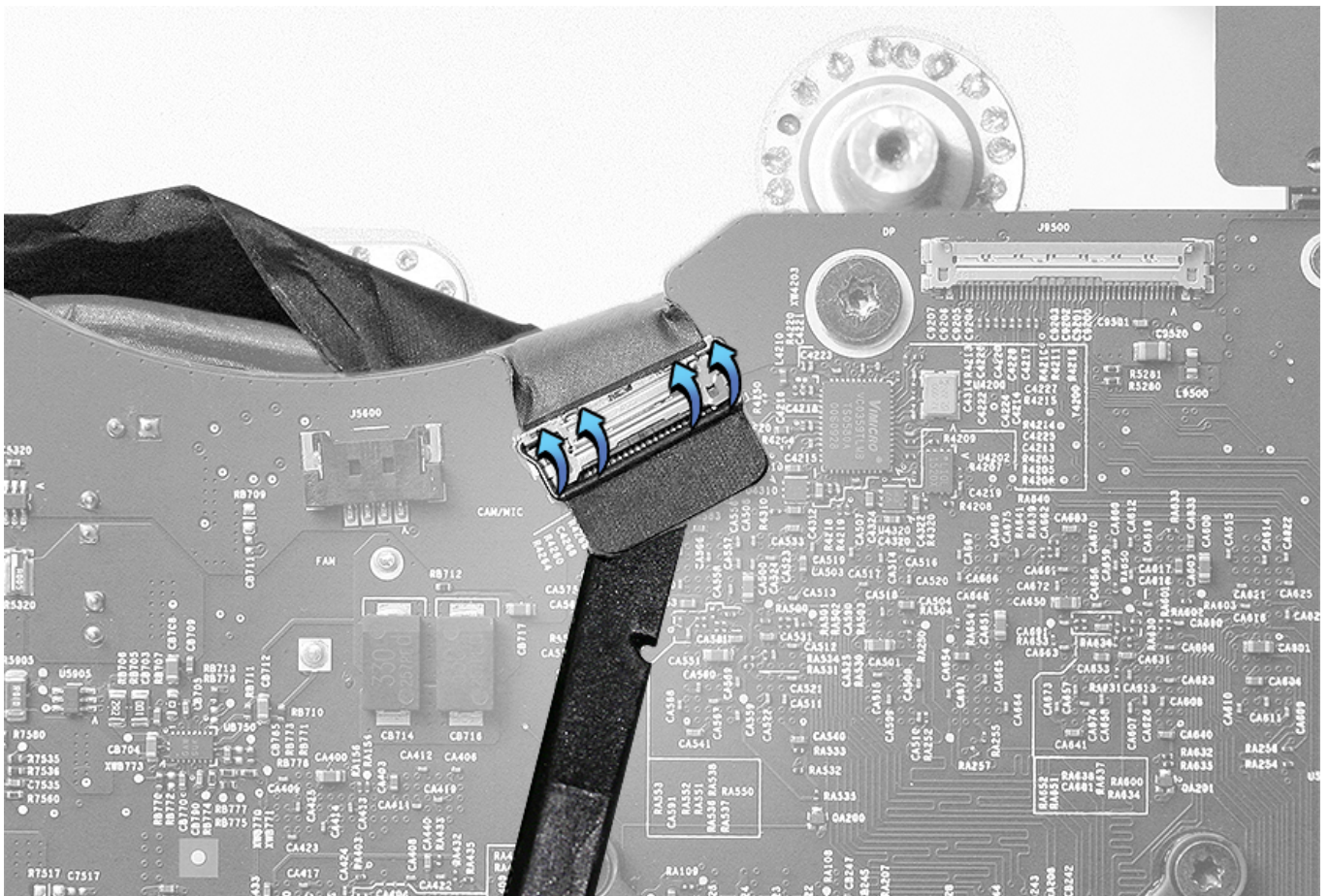


3. Before removing the cable, note the cable routing.



4. Use a black stick to “unlock” the camera cable lock bar by flipping the locking-lever bar back. Gently pull the cable — not the lock bar — to disconnect the cable.

5. Remove the cable from the rear housing.



Steps For Reassembly

1. Position the camera/microphone cable in the rear housing.
2. Connect the microphone cable to connector on the microphone board.
3. Connect the camera cable to the camera board. Flip the locking-lever bar up and check that it is secure.
4. Press along the cable to adhere it to the rear housing.
5. Insert the camera cable into the logic board connector and flip the locking-lever bar toward the logic board. Press down around the locking-lever bar to securely lock the cable connector in place.
6. Reinstall the [fan](#).
7. Install new [display panel VHB strips](#).
8. Reinstall the [display panel](#).

Chin Strap

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

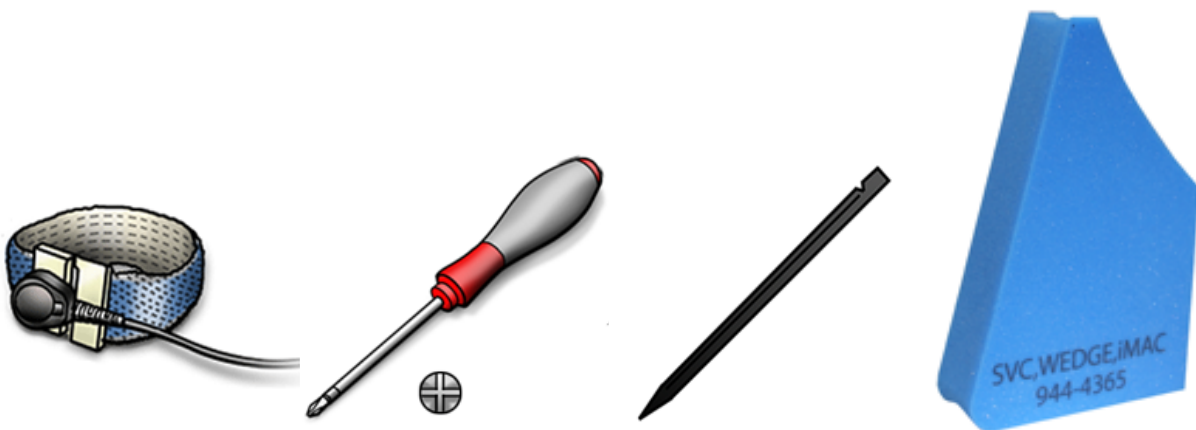
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)



Tools

- ESD wrist strap and mat
- Phillips #00 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)



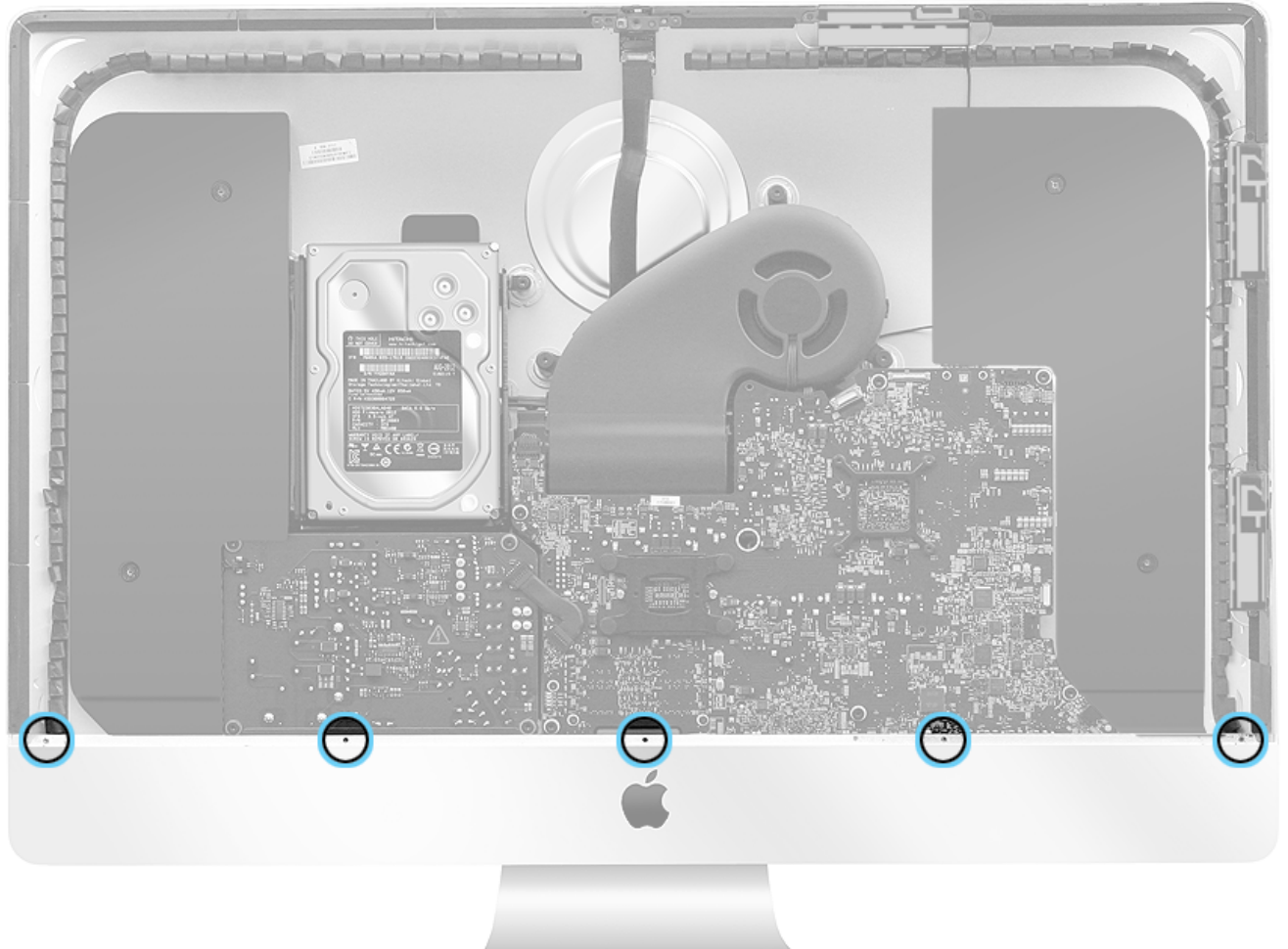
Steps For Removal

1. Remove screws:

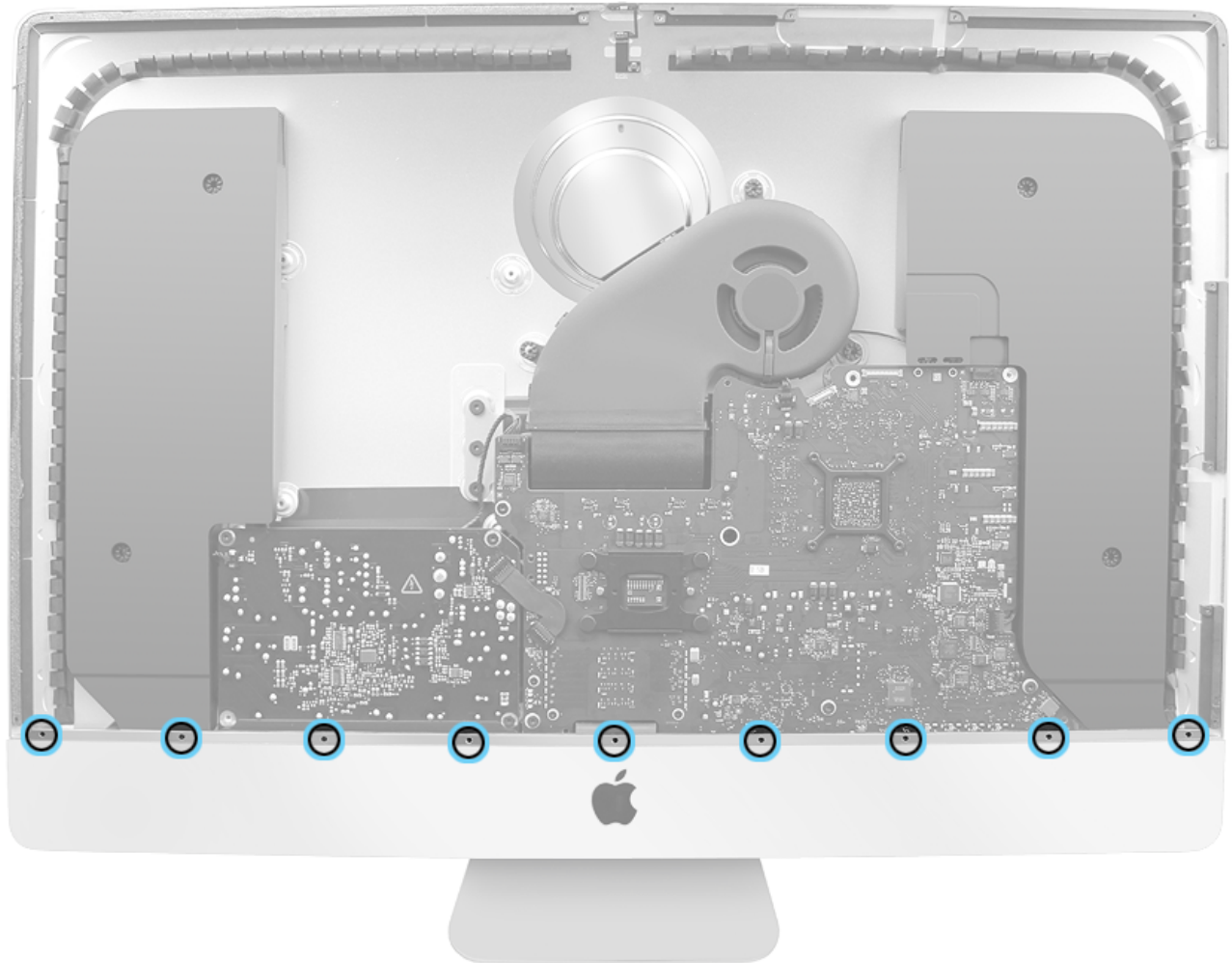
- Late 2012:
 - Five 3 mm Phillips #00 screws (923-0338)
- Late 2013 and Retina 5K:
 - Nine 3 mm Phillips #00 screws (923-0338)



iMac (27-inch, Late 2012)



iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



2. Set the chin strap aside. **Caution:** Be careful not to bend the chin strap.

iMac (27-inch, Late 2012) - 5-hole chin strap



iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) - 9-hole chin strap



Steps For Reassembly

Important: Before ordering a replacement chin strap, check whether the system has a 5-hole chin strap or 9-hole chin strap. If the system has a 5-hole chin strap, then order the iMac (27-inch, Late 2012) chin strap kit. If the system has a 9-hole chin strap, then order the iMac (27-inch, Late 2013) / iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) chin strap kit.

1. Insert the chin strap into the rear housing. Be sure the metal screw holes face the inside edge of the chin on the rear housing. The foam edge on the chin strap should be facing up.



2. Use a black stick to press the chin strap against the front frame, if needed. Refer to the next step for screw replacement order.



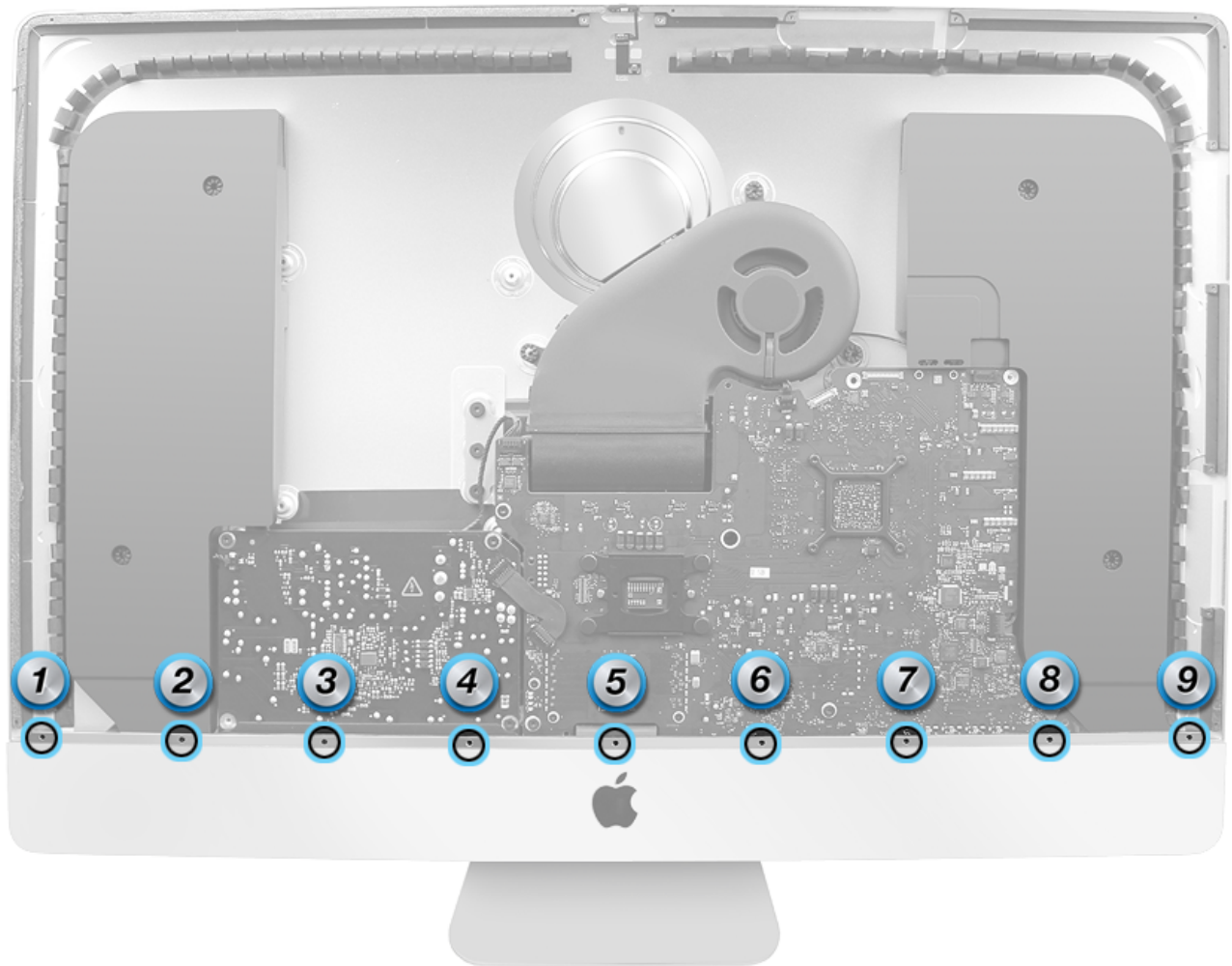
3. Install five 3 mm Phillips #00 screws (923-0338) in the following order:

iMac (27-inch, Late 2012): 5-hole chin strap



4. Install nine 3 mm Phillips #00 screws (923-0338) in the following order:

iMac (27-inch, Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015): 9-hole chin strap



5. Install new [display panel VHB strips](#).

6. Reinstall the [display panel](#).

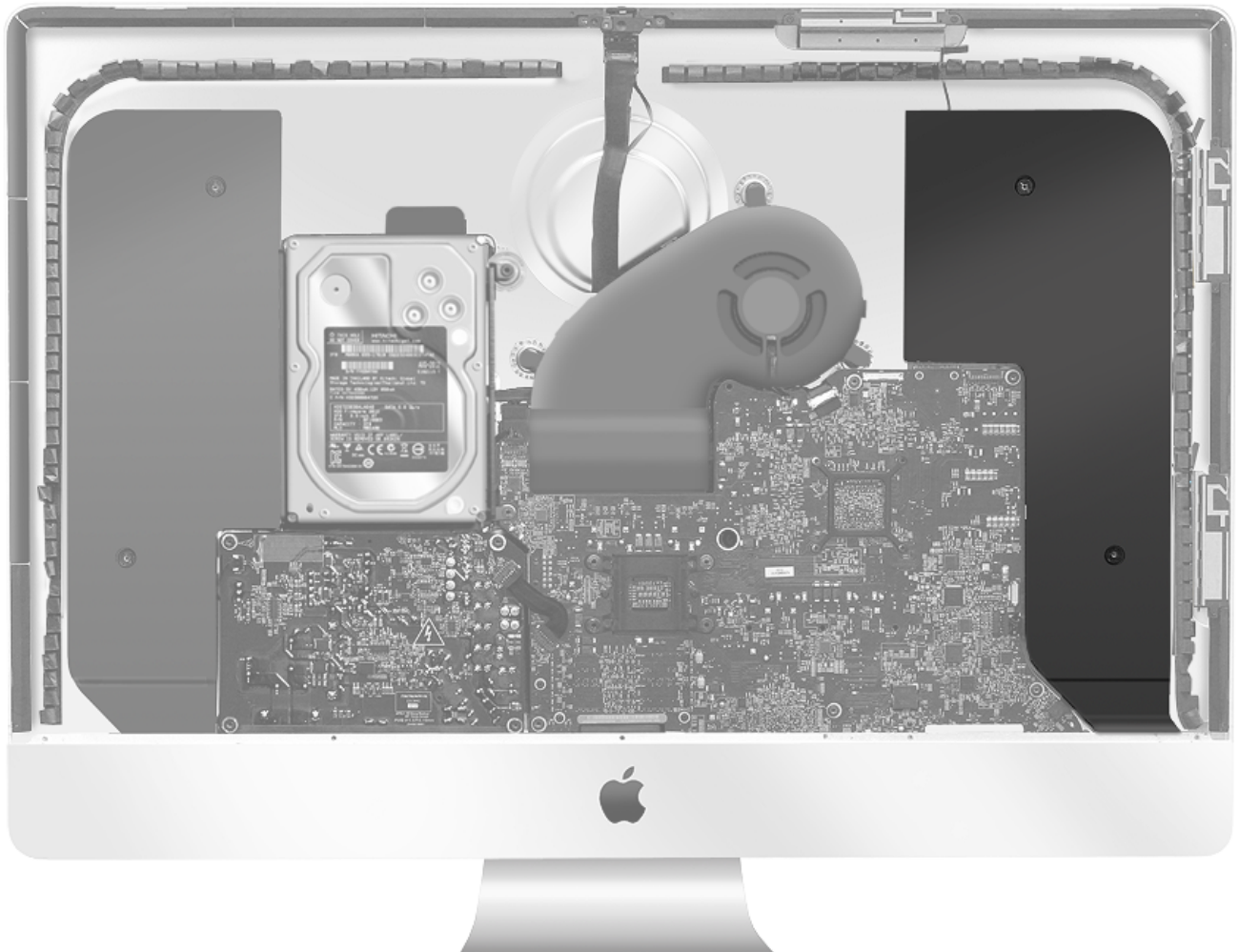
Right Speaker

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

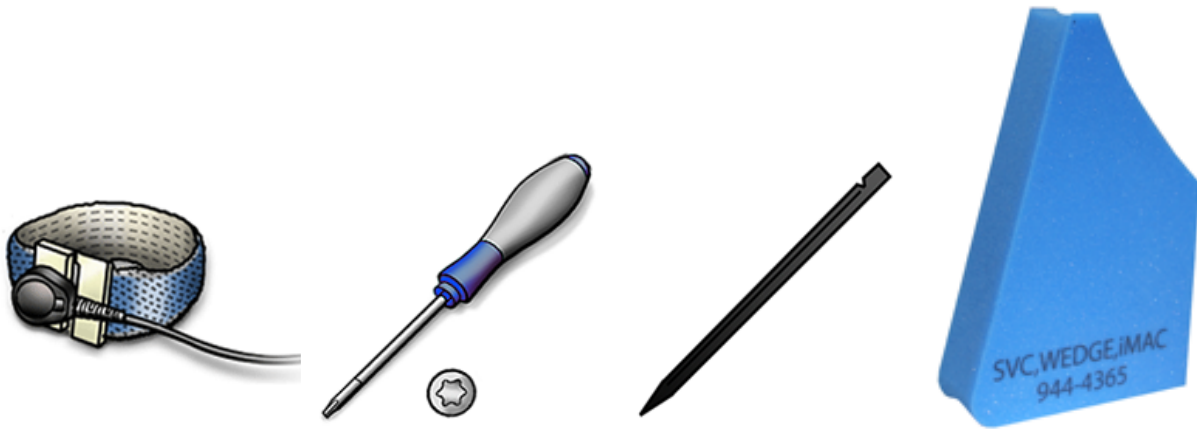
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)

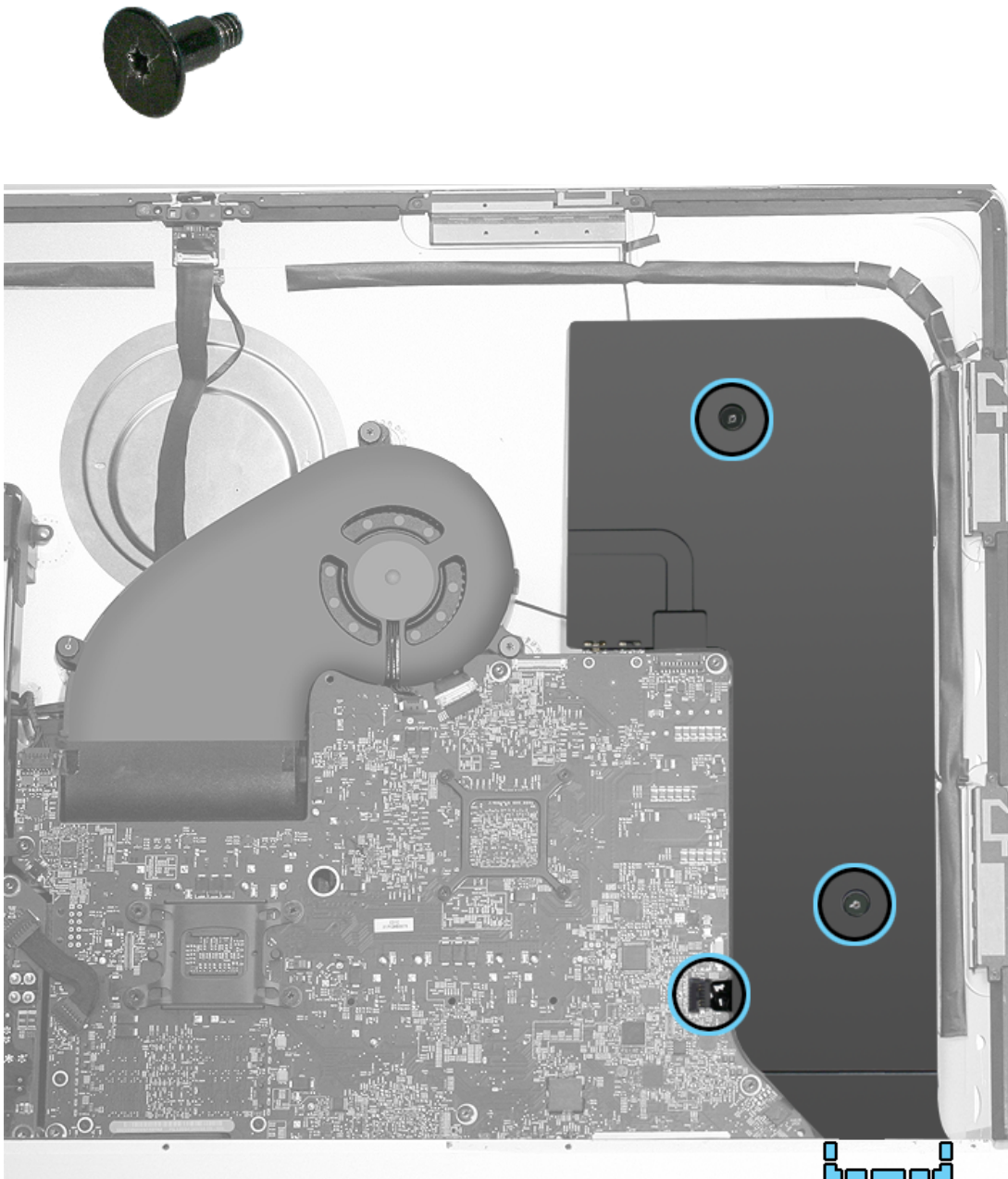


Steps For Removal

Note: The speakers must be replaced in pairs. For left speaker removal instructions, refer to article [RP957: Left Speaker](#).

1. Completely unscrew two T10 screws and disconnect the speaker cable from logic board. **Note:** The screws tighten into rubber grommets and may remain in the screw holes when the speaker is removed. **Note:** The iMac (27-inch, Late 2013) model is shown for this procedure.

- 923-0333 (10 mm)



2. Pull speaker forward slightly (#1), then slide the speaker up (#2) and out of the rear housing.



Steps For Reassembly

1. Carefully insert the speaker all the way into the rear housing.

Note: Push firmly to ensure that the speaker sits down inside the rear housing as far as possible. If the speaker is not positioned correctly in the rear housing, then it can cause display interference issues.

2. Connect the speaker cable to the logic board and tuck the speaker cable under the logic board.

3. Install the two speaker screws.

4. Reinstall the [chin strap](#).

5. Install new [display panel VHB strips](#).

6. Reinstall the [display panel](#).

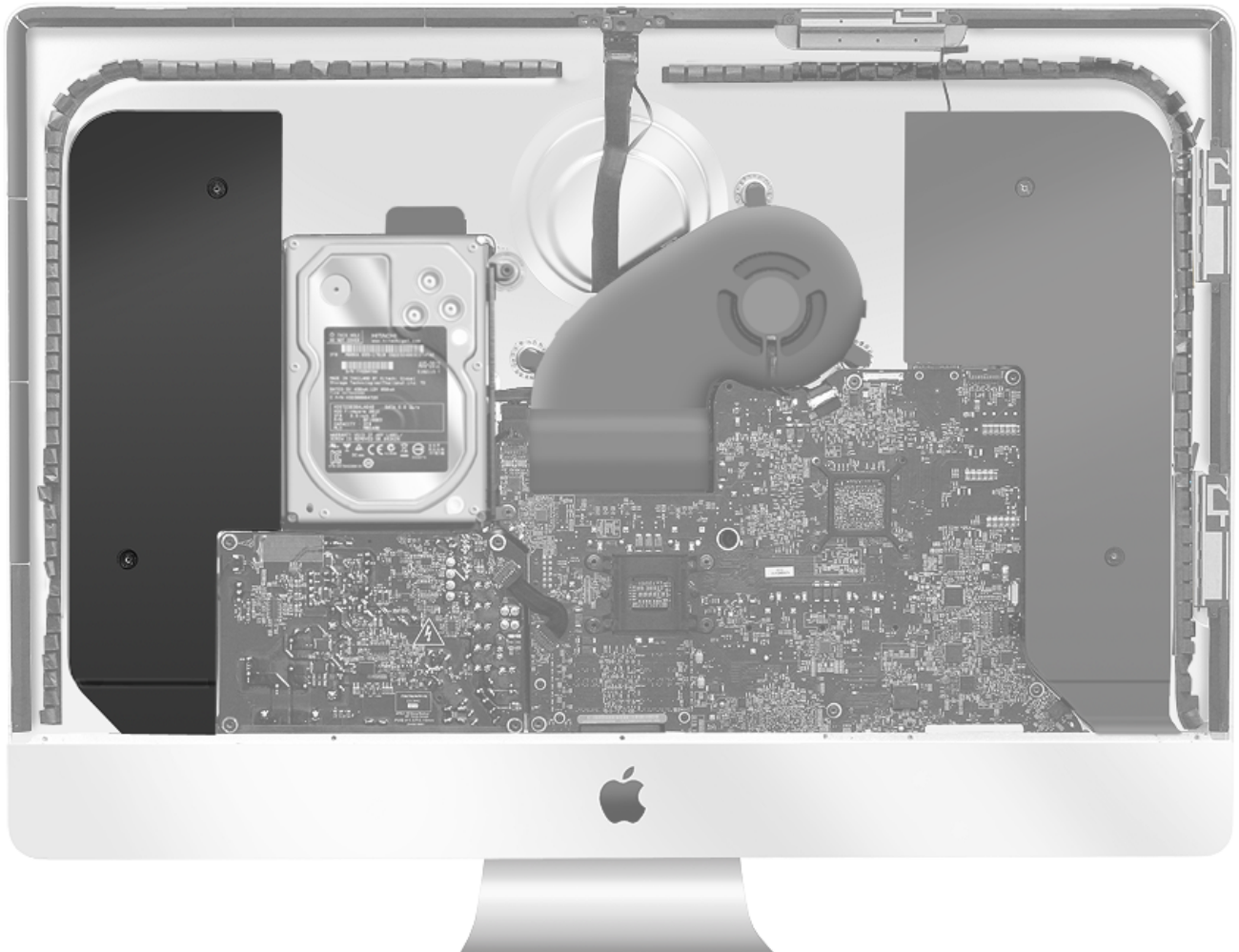
Left Speaker

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

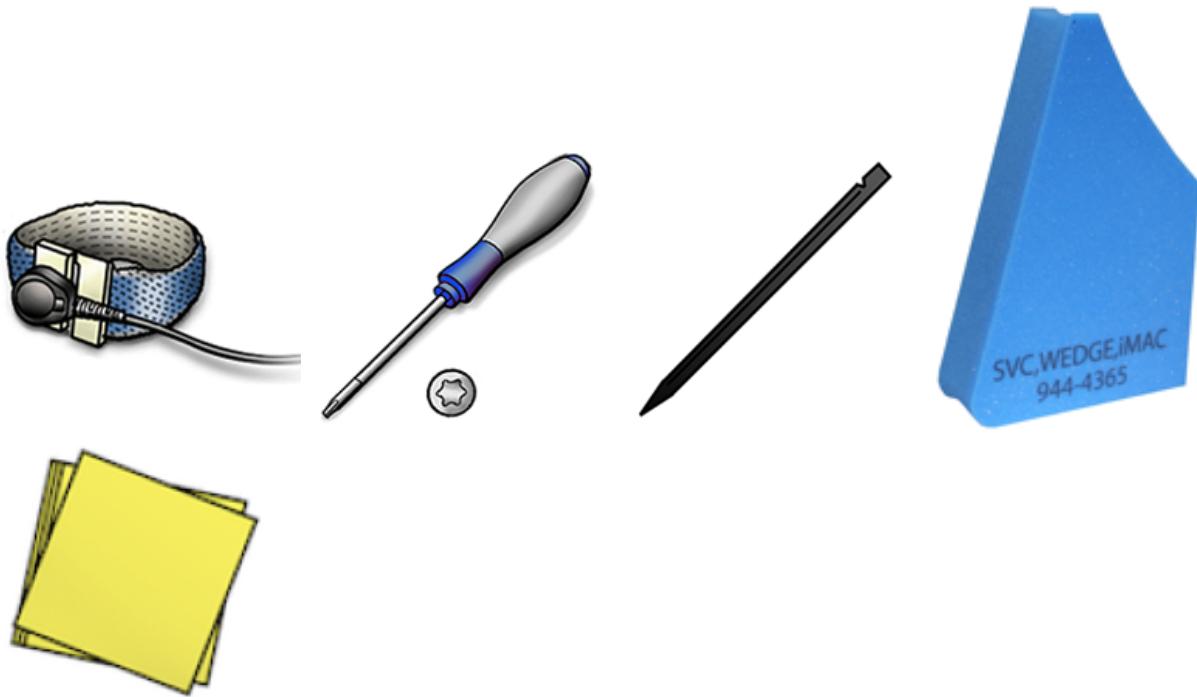
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)
- Sticky notes



Steps For Removal

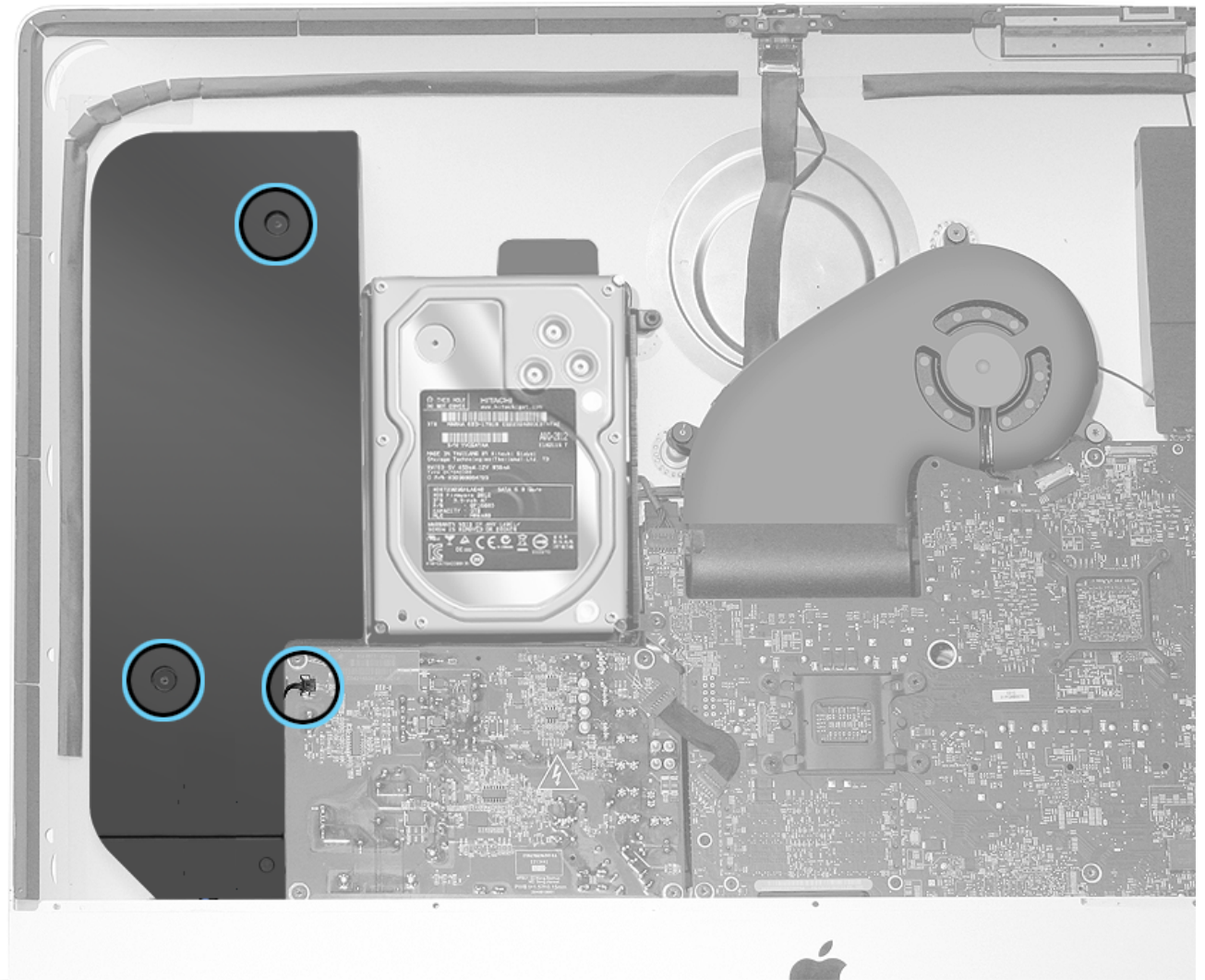
Note: The speakers must be replaced in pairs. To remove the right speaker, refer to article [RP956: Right Speaker](#).

1. Carefully disconnect the power button cable from the power supply. **Important:** If the power button cable breaks, then the rear housing will need to be replaced. The power button cable is part of the rear housing.

2. Completely unscrew two T10 screws. **Note:** The screws tighten into rubber grommets and may remain in the screw holes when the speaker is removed.

- 923-0333 (10 mm)

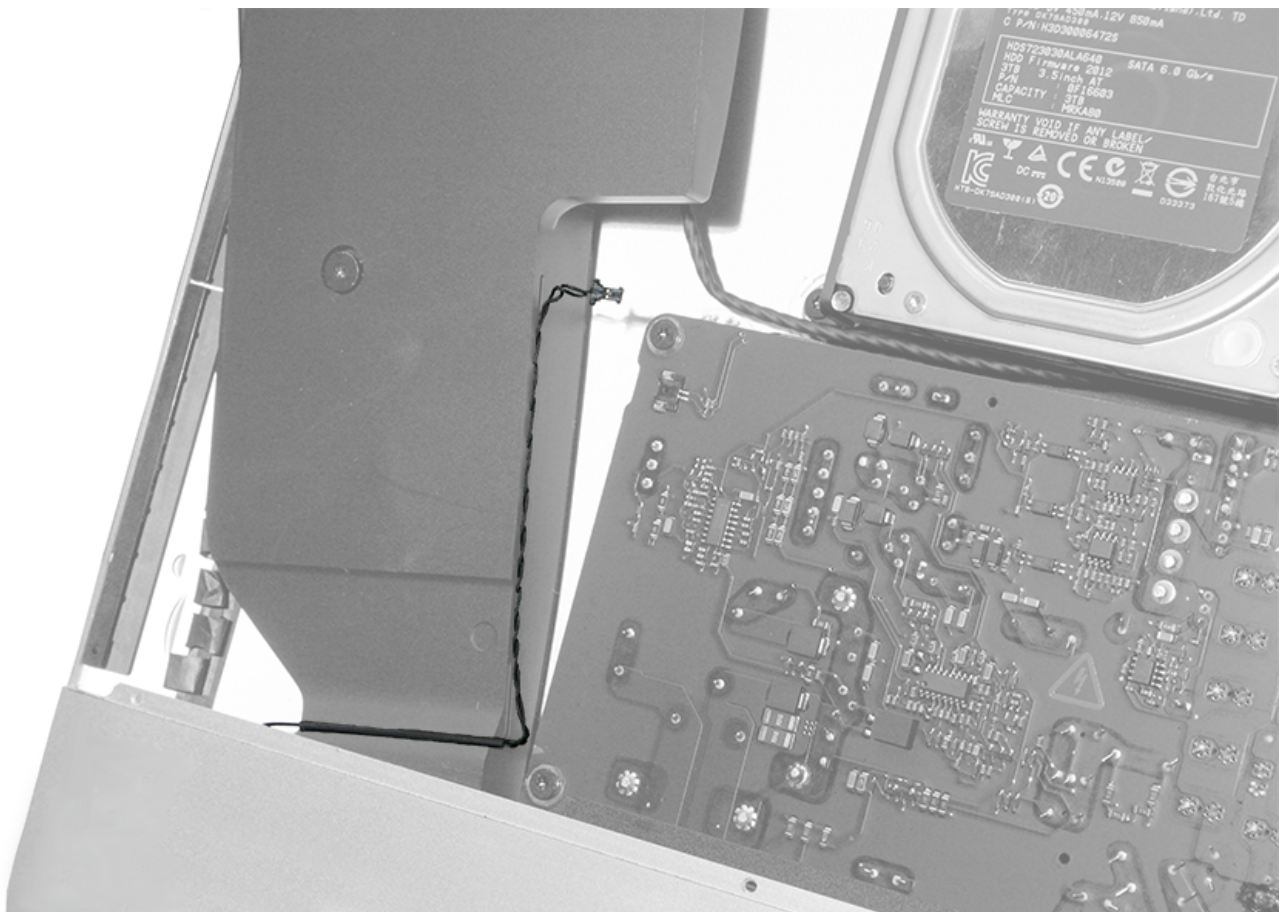




3. Pull the speaker forward, then push in on the lower end of the speaker (to clear the rear housing). Lift the speaker up and off to the side until the power button cable is visible.



4. Gently remove the power button cable from the routing groove on the side and the lower end of the speaker.



5. Tilt the speaker to the left.

Note: On the iMac (Late 2012 and Late 2013) models, the hard drive must be removed to disconnect the left speaker cable from the logic board. Follow steps 6 and 7 to remove the hard drive. On the iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) models, the hard drive does not need to be removed to access the speaker cable connector on the logic board. Proceed to removal step 8.

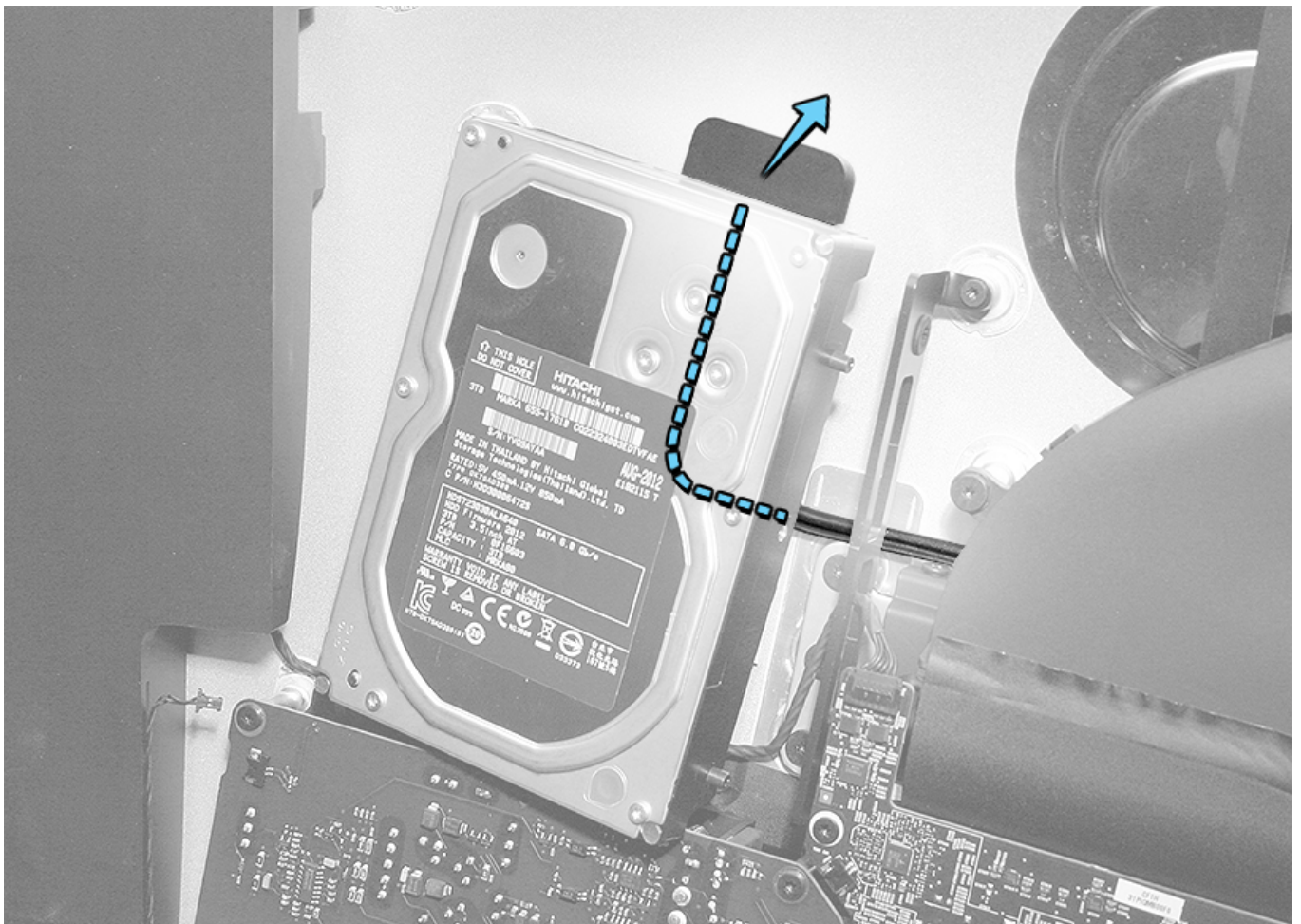


6. Support the hard drive with one hand. Remove two T10 screws from the left mounting bracket.

- 923-0331



7. Disconnect the data and power cable from the top of the hard drive. Slide the hard drive out of the right mounting bracket.



8. Disconnect the speaker cable from the logic board. Lift the speaker out of the rear housing.

Note: The speaker cable runs under the hard drive and the right hard drive bracket. On reassembly, tuck the excess cable under the hard drive or power supply.

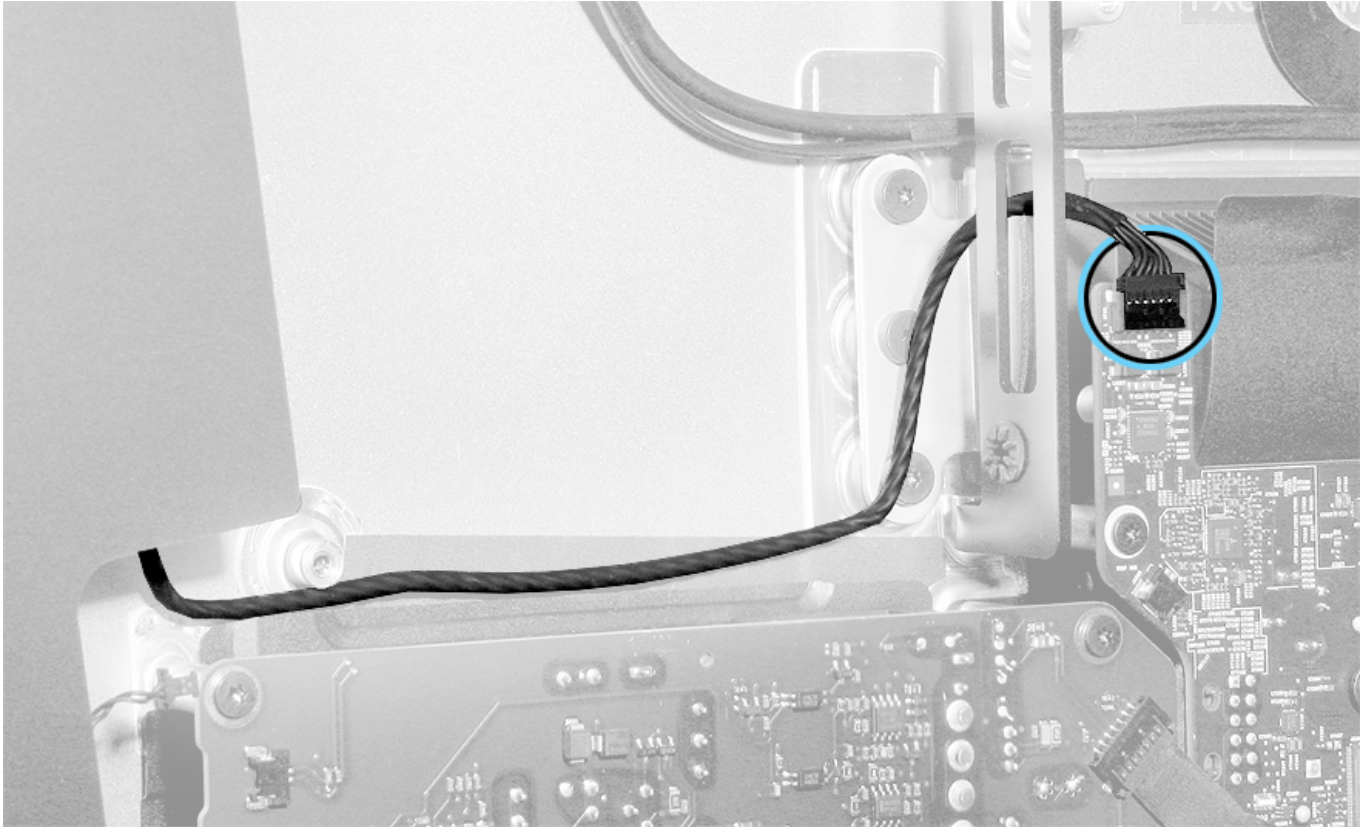


Steps For Reassembly

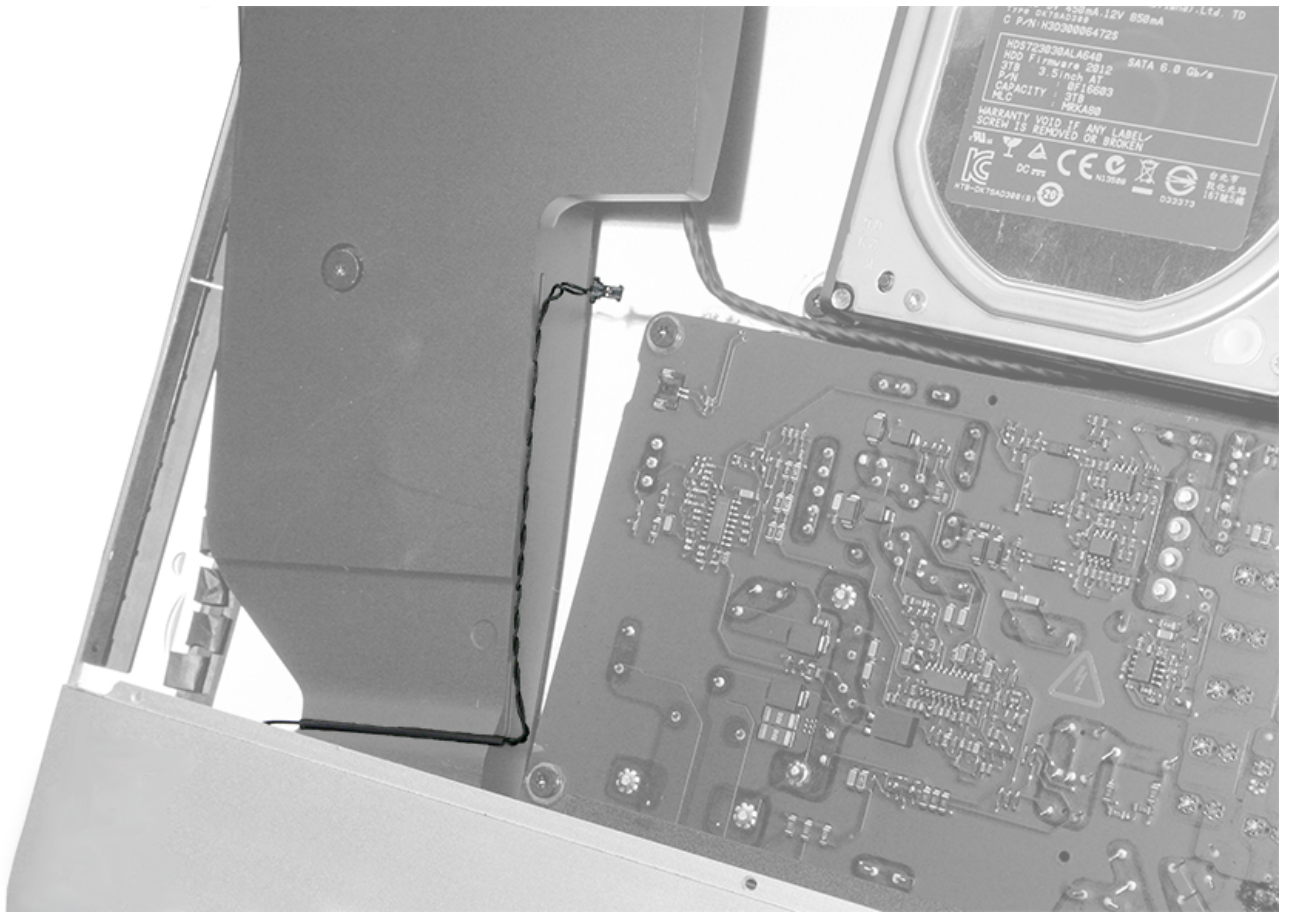
1. Install the power button cable into its routing groove on the left speaker. **Important:** If the power button cable breaks, then

the rear housing will need to be replaced. The power button cable is part of the rear housing.

2. On the iMac (Late 2012 and Late 2013) models, install the left mounting bracket and hard drive. If you are repairing an iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015), then go to the next step.
3. On the iMac (Late 2012 and Late 2013) models, route the speaker cable along the top edge of the power supply and under the right mounting bracket. On the iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015), route the speaker cable around the top edge of the power supply and along the right side of the right mounting bracket.
4. Connect the speaker cable to the logic board.



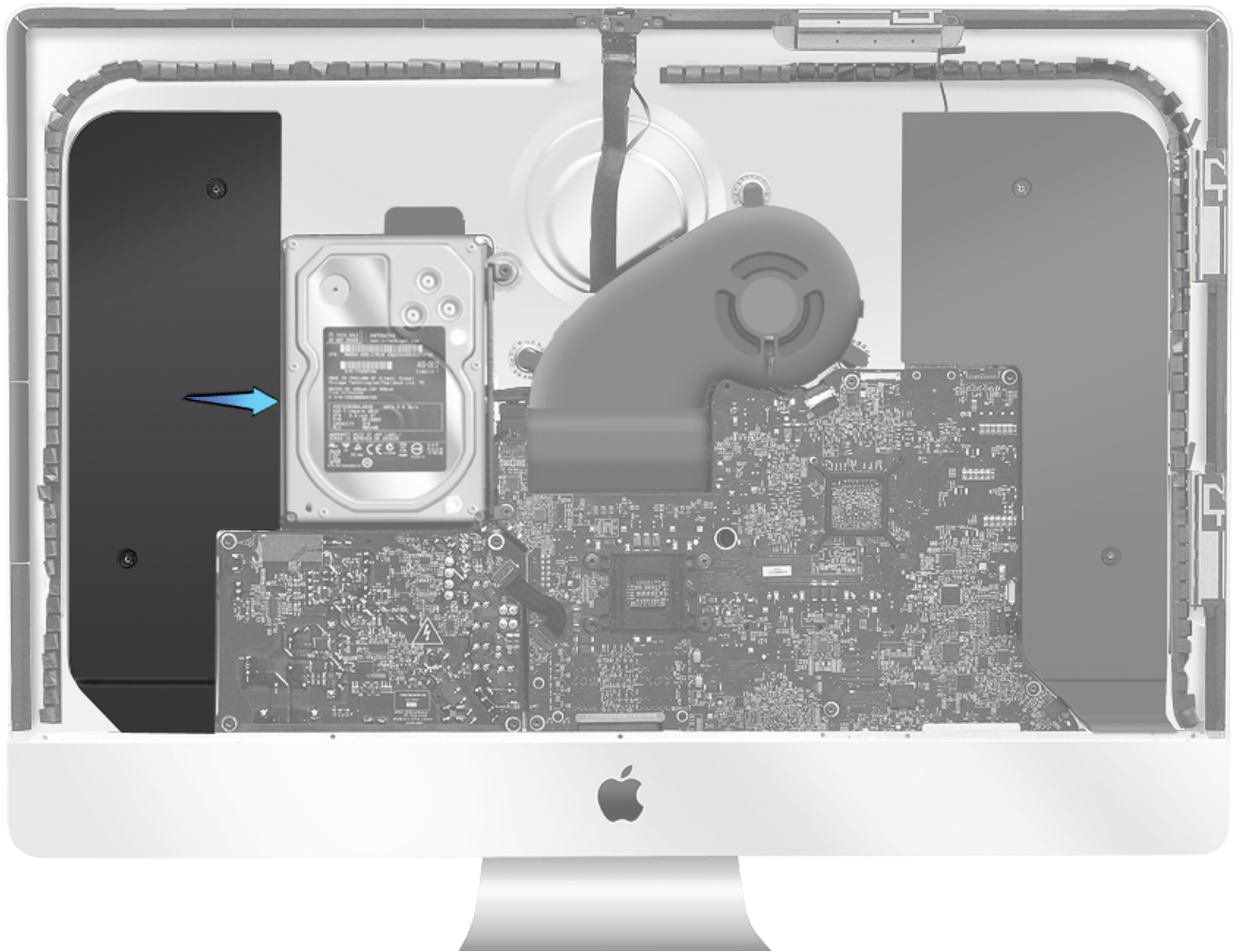
5. Position the speaker in the rear housing. Ensure that the power button cable does not bind or slip out of the routing groove as you place the speaker into the rear housing.



6. Lower the speaker the rest of the way into the rear housing.



7. Correct spacing between the left speaker and hard drive requires inserting a 1.85 mm shim between the left speaker and hard drive (shown by the arrow below). Stack 18 individual sticky notes to make a 1.85 mm shim. Insert the shim between the speaker and hard drive. Tighten the speaker screws after inserting the shim.

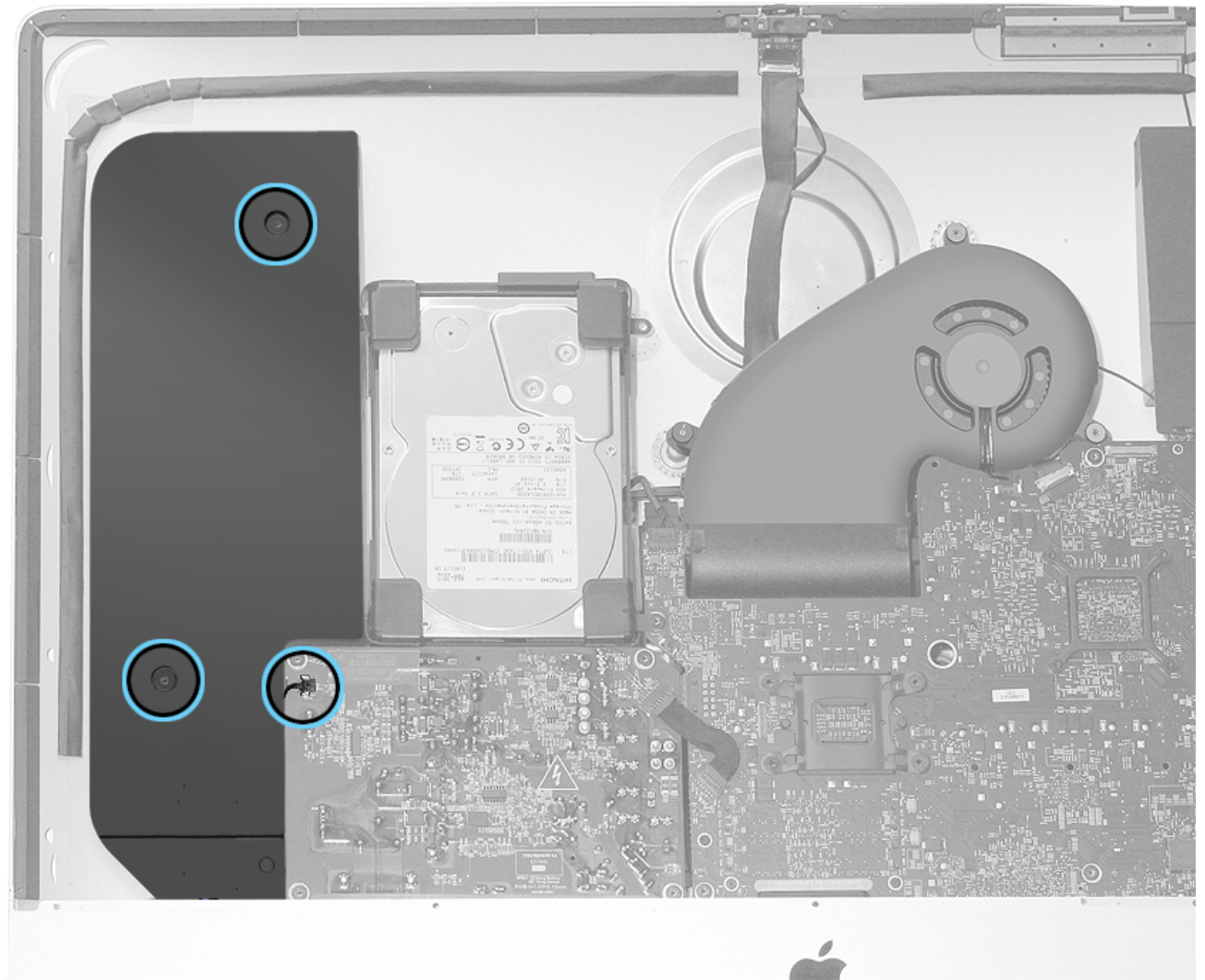


8. Connect the power button to the power supply.

9. Install two T10 screws.

- 923-0333 (10 mm)





10. Reinstall the [chin strap](#).
11. Install new [display panel VHB strips](#).
12. Reinstall the [display panel](#).

Hard Drive

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: About AppleCare service certifications](#).

For video instruction, refer to article [SV244: Hard Drive Replacement Video](#).

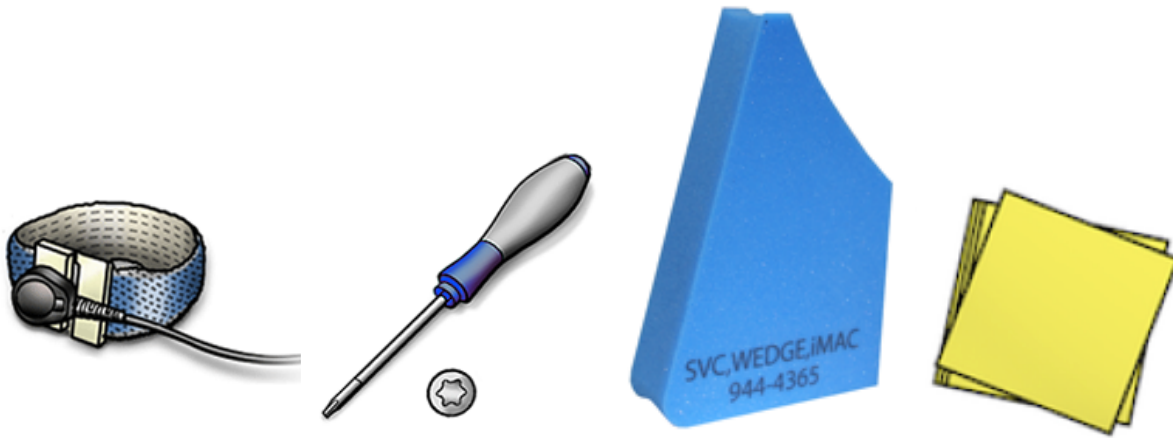
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Left speaker](#)



Tools

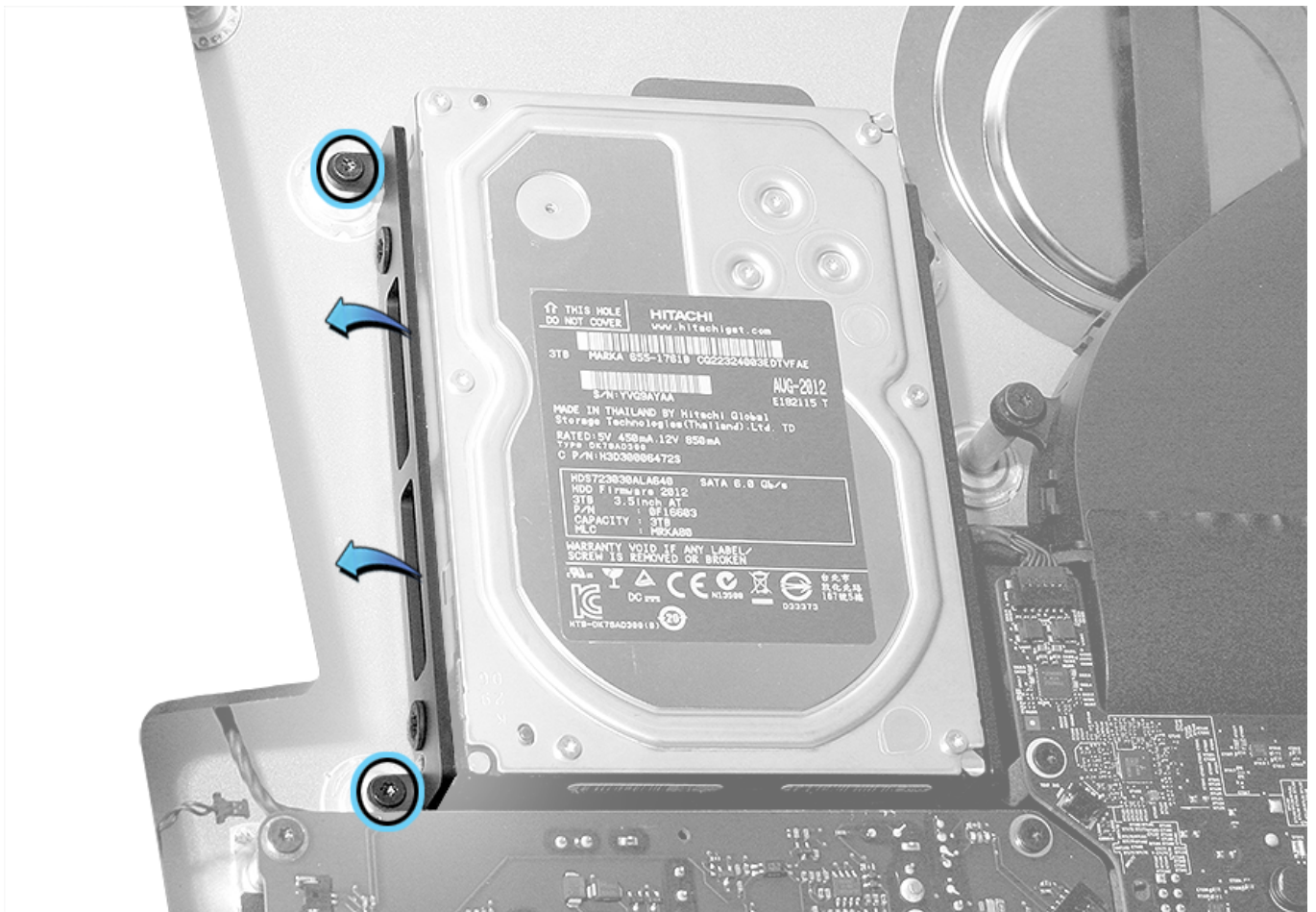
- ESD wrist strap and mat
- Torx T10 screwdriver (magnetized)
- Torx T8 screwdriver (magnetized)
- Service wedge (iMac)
- Sticky notes



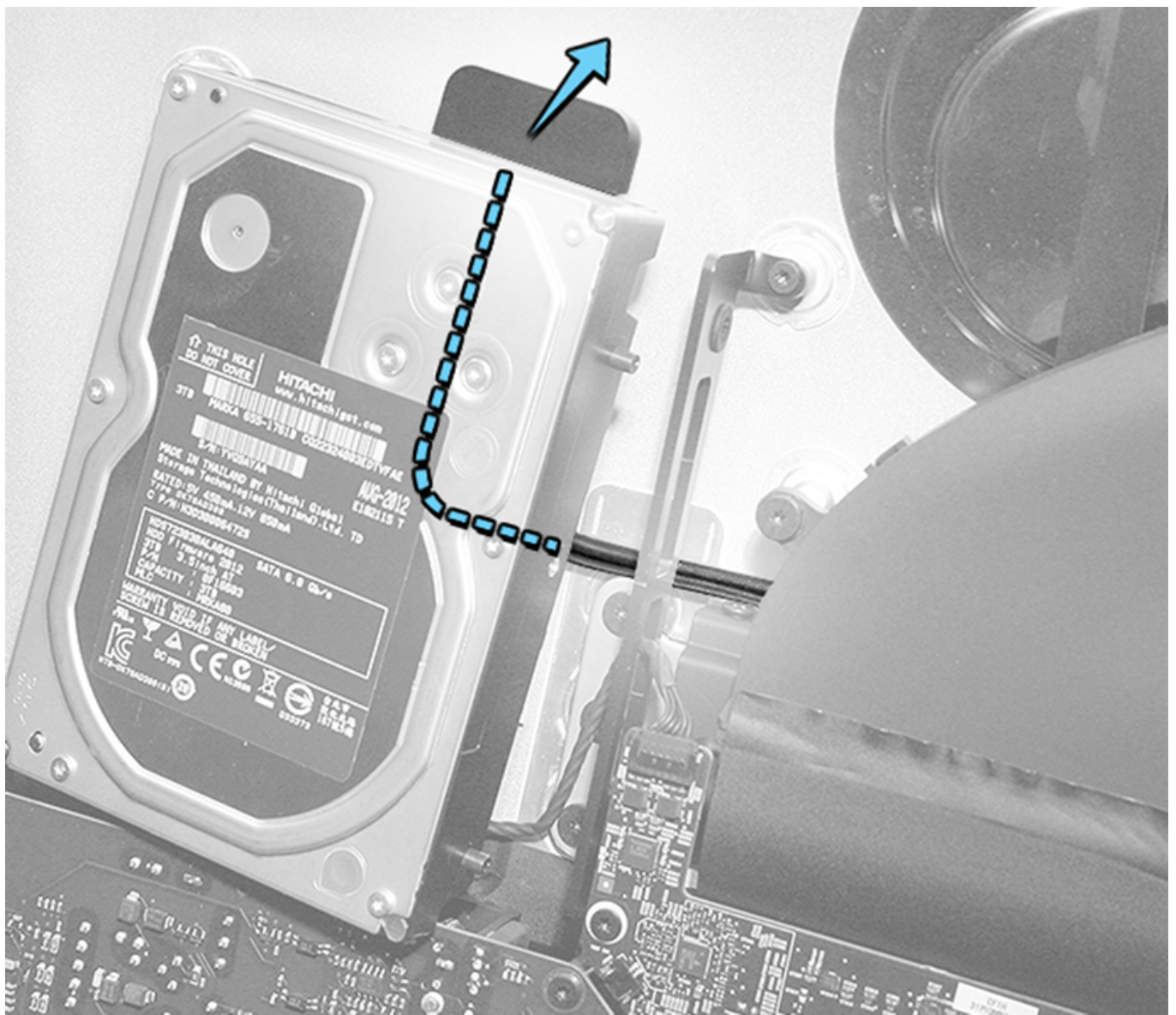
Steps For Removal

1. While supporting the hard drive with one hand, remove two screws from the left mounting bracket. Slide the hard drive out of the rubber grommets on the right mounting bracket.

- T10: 923-0331

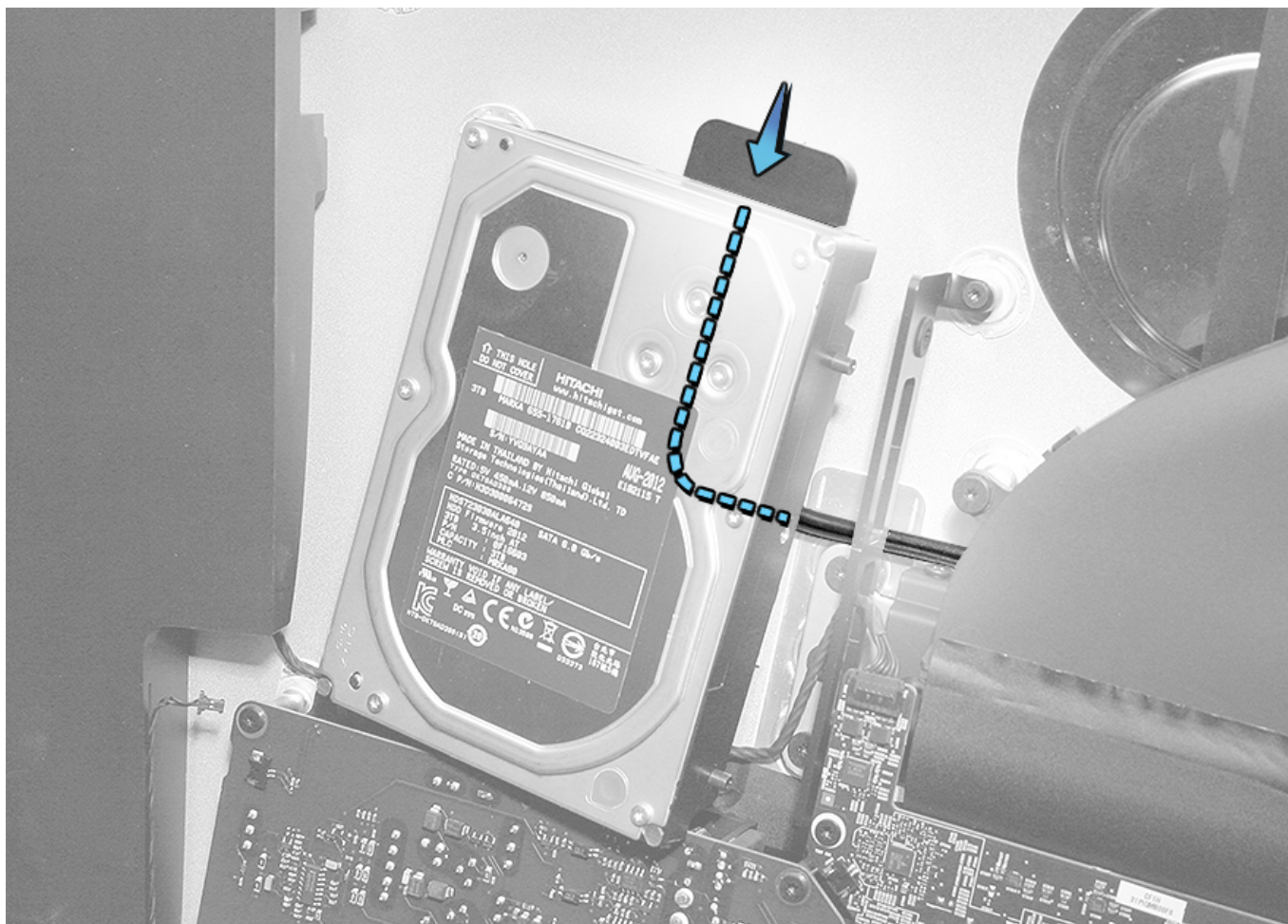


2. Disconnect the hard drive data cable from the top of the hard drive.

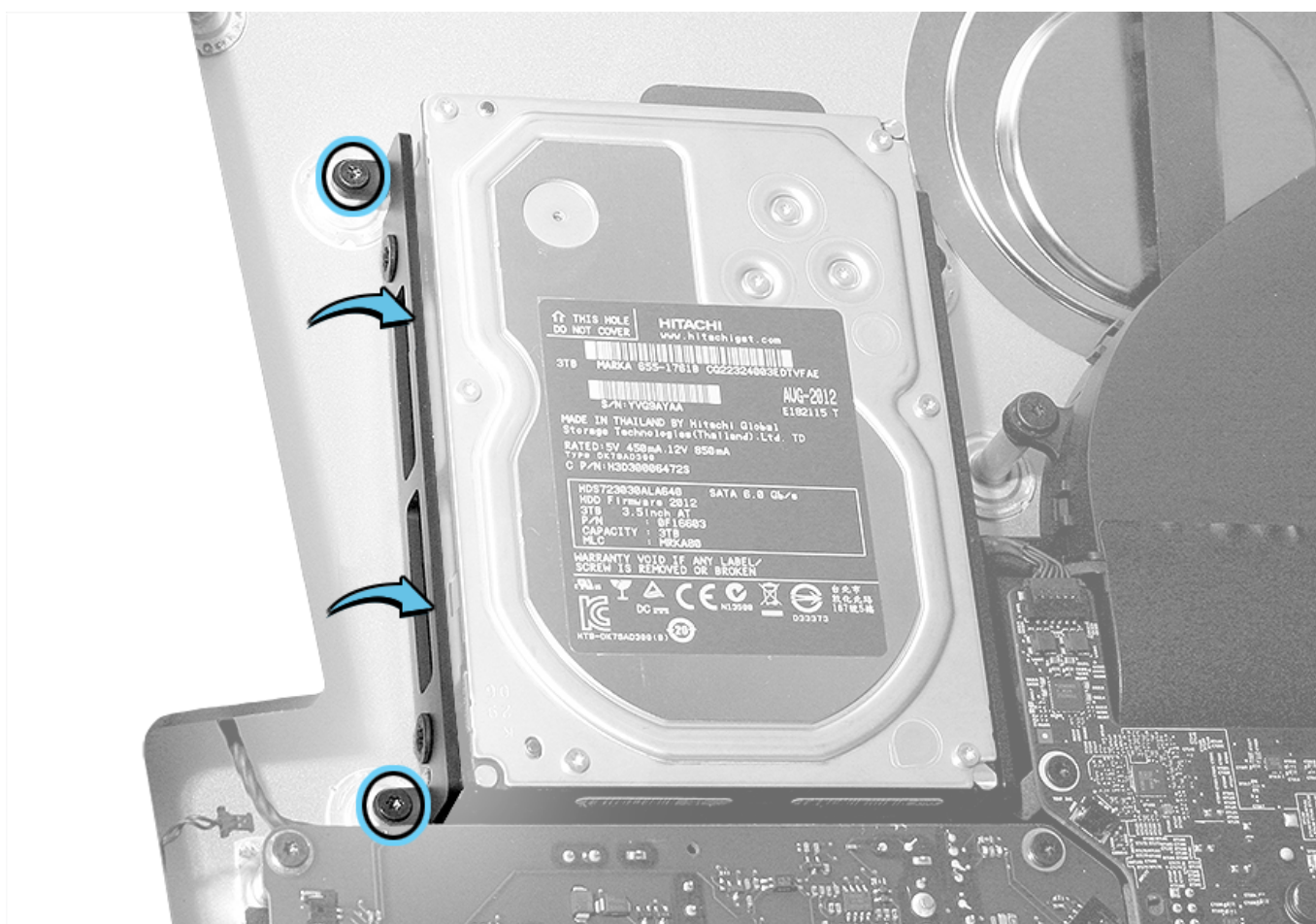


Steps For Reassembly

1. If installing a replacement hard drive, transfer the four T8 screw pins.



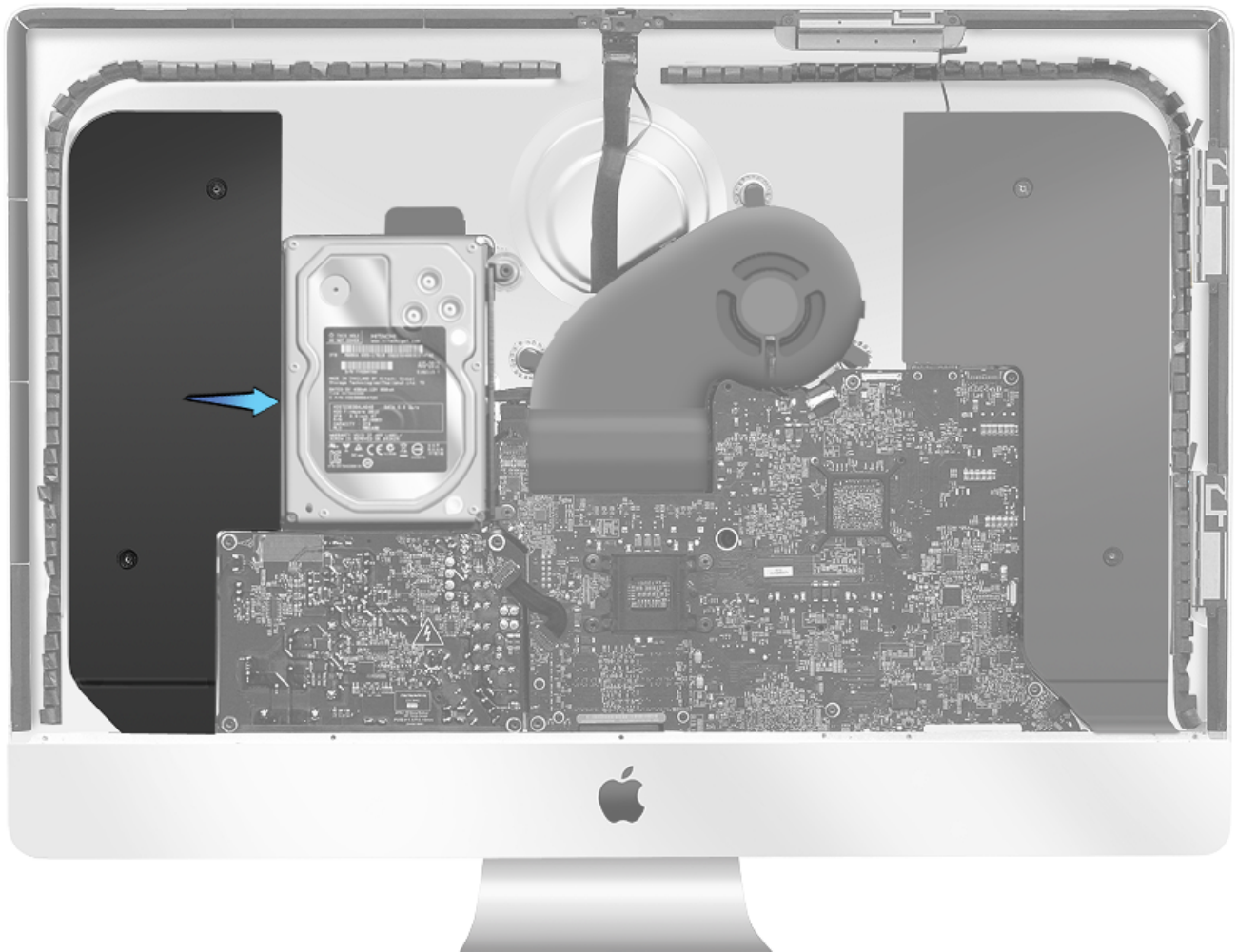
4. Reinstall the left hard drive bracket and bracket screws.



5. Reinstall the [left speaker](#) into the rear housing.

6. Connect the power-on cable to the power supply.

7. Correct spacing between the left speaker and hard drive requires inserting a 1.85 mm shim between the left speaker and hard drive (shown by arrow below). Stack 18 individual sticky notes to make a 1.85 mm shim. Insert the shim between the speaker and hard drive. Tighten the speaker screws after inserting the shim.



8. Reinstall the [chin strap](#).

9. Install new [display panel VHB strips](#).

10. Reinstall the [display panel](#).

11. Refer to article [TP767: Reinstalling Software That Came with the Computer](#).

Reinstalling Software That Came with the Computer

Reinstalling Software That Came with the Computer

This procedure requires an Internet connection.

Note: In some situations, a user may have set a firmware password via a feature such as Find My Mac or FileVault. The user must know the firmware password in order to reinstall OS X or macOS. If the user cannot remember the password, then refer to the technician instructions in article [HT203409: If you lost or forgot your firmware password](#).

Important: Apple recommends that users back up their data before any software restore procedure. Back up essential files before installing OS X or macOS. Apple is not responsible for any loss of data.

1. Choose Apple menu > Restart, then hold down the Command (⌘) and R keys while the computer restarts.
Note: To force OS X Lion or later, or macOS Sierra, into Internet Recovery, press and hold the Command-Option-R key combination while starting up the computer.
2. If the computer is not connected to the Internet, choose a network from the Wi-Fi menu (in the top-right corner of the screen).
3. Select "Reinstall OS X" (or macOS), then click Continue.
4. Follow the onscreen instructions. In the pane where you select a disk, select your current OS X or macOS disk (in most cases, it is the only one available).
5. To start the installation, click Install.

Check for and apply the latest software and firmware updates.

For more information, refer to article [HT201314: About macOS Recovery](#).

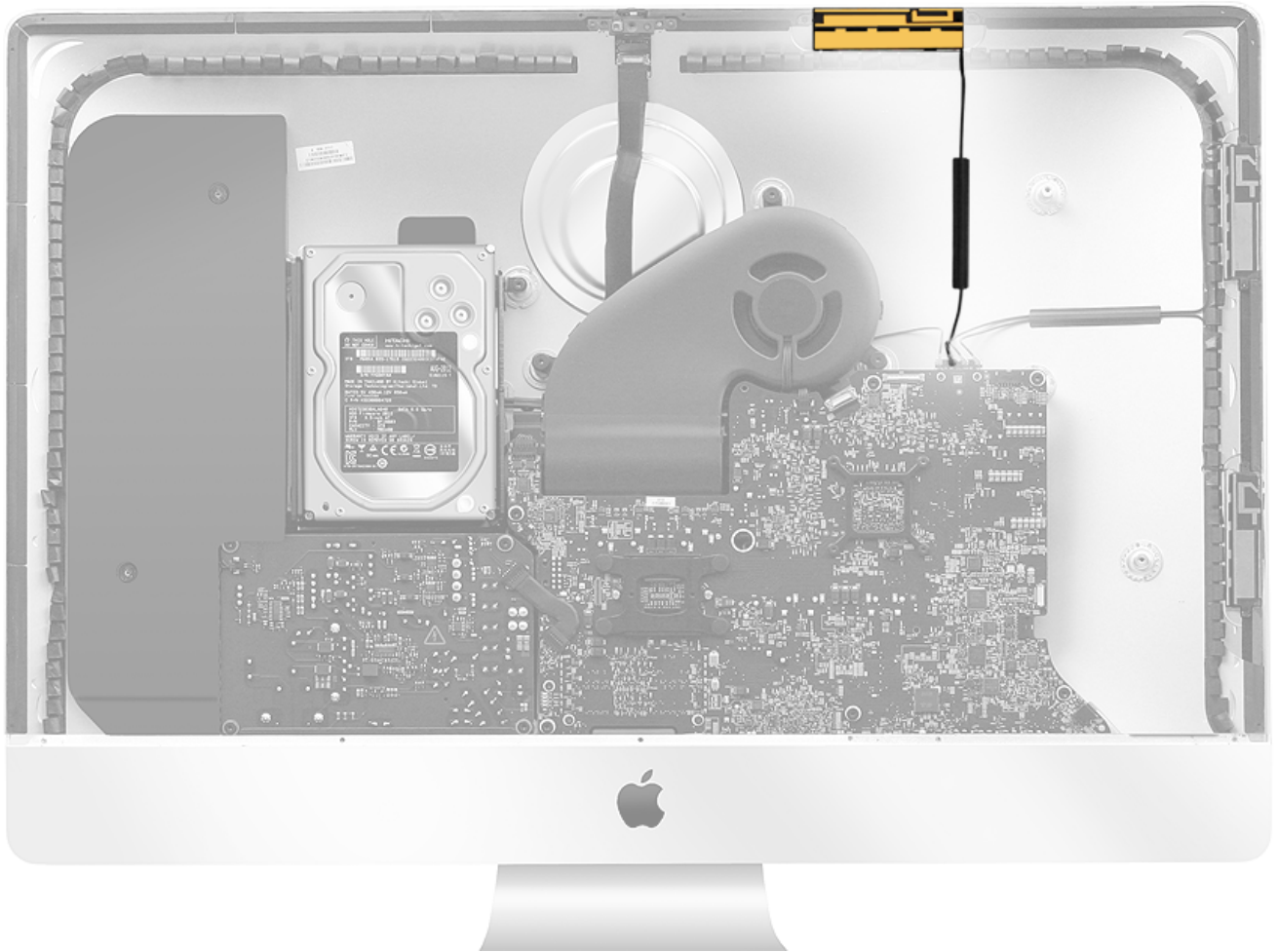
Bluetooth Antenna, Upper

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

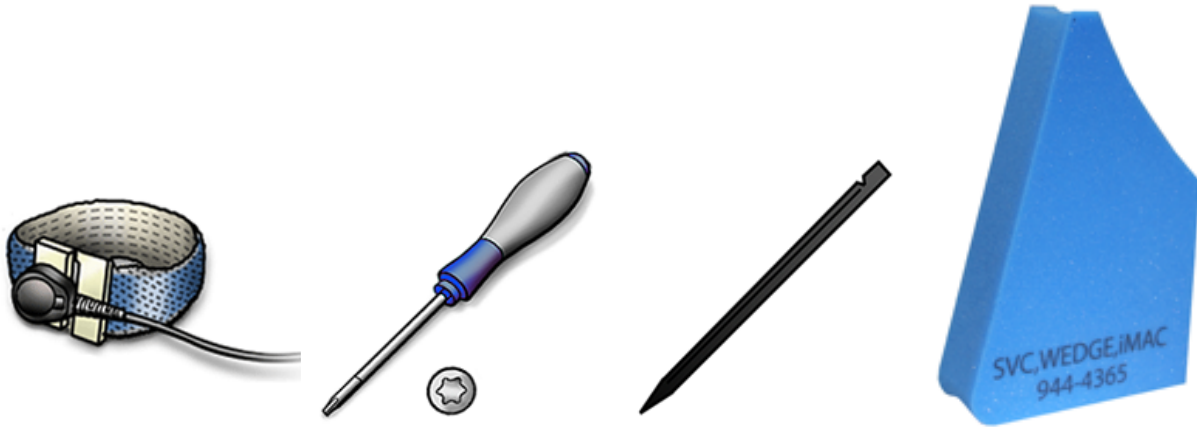
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

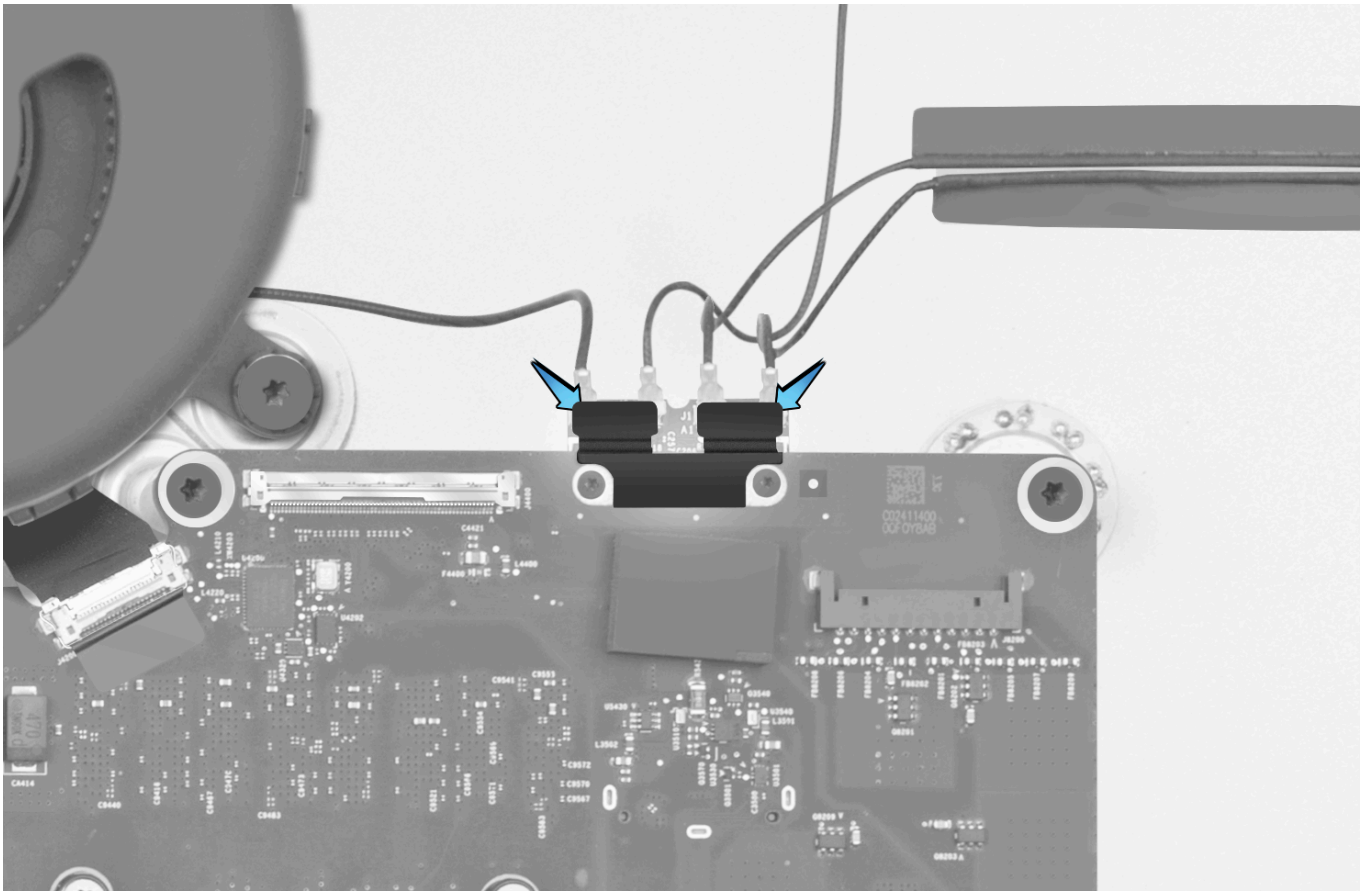
- ESD wrist strap and mat
- Torx T4 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)



Steps For Removal

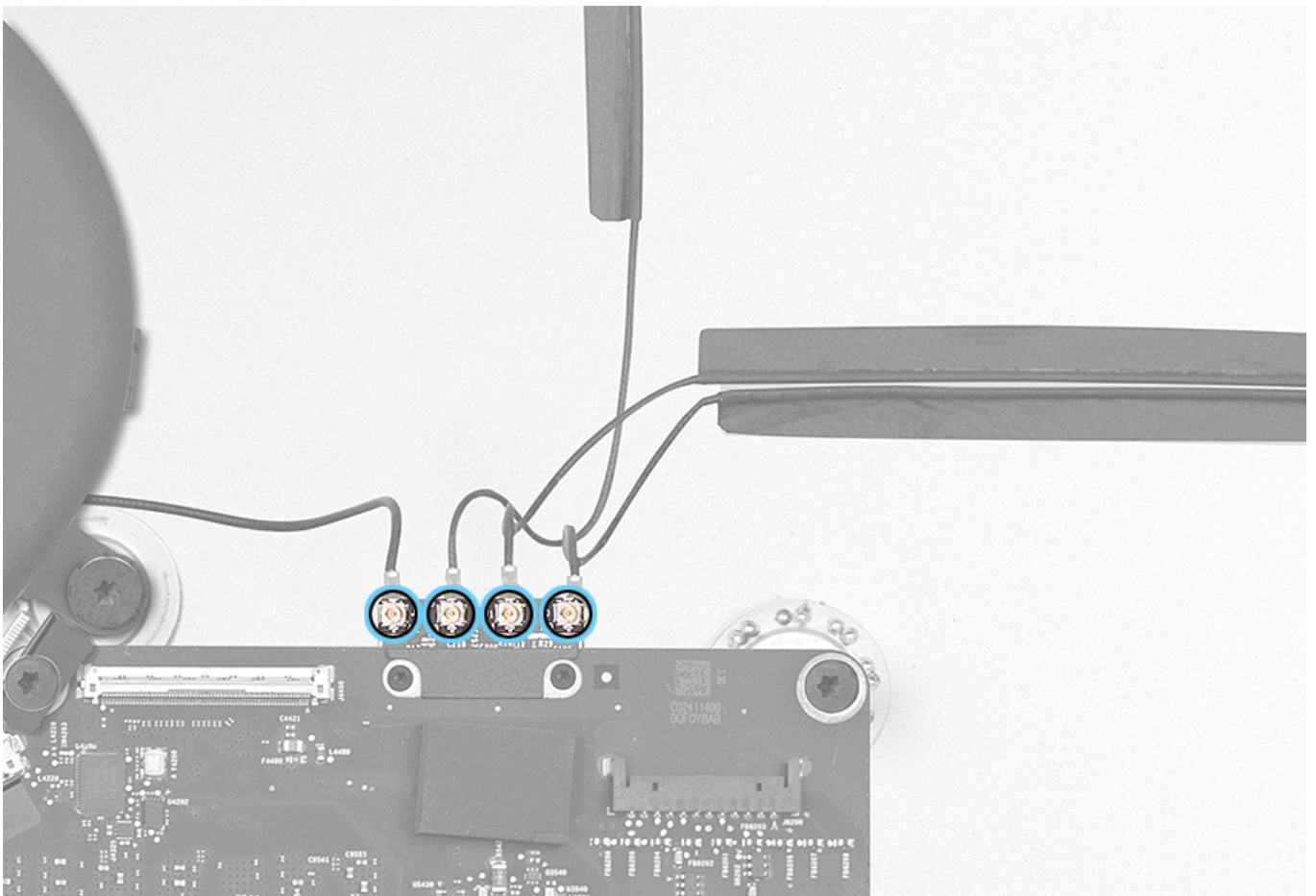
Note: The iMac has four Wi-Fi/Bluetooth antennas, three of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be replaced by replacing the rear housing.

1. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick to peel down the tape that covers the antenna cable connectors.

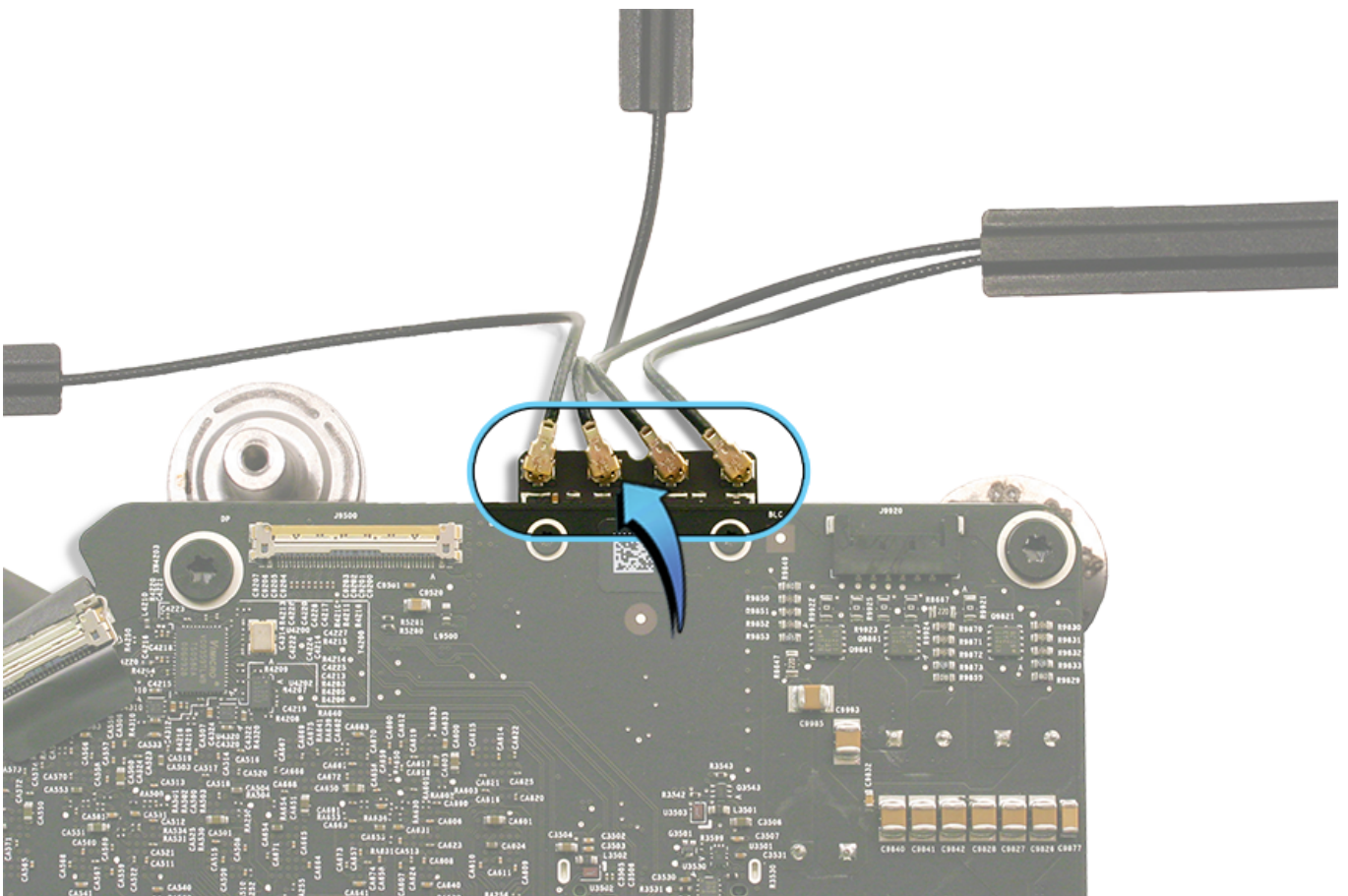


2. On the wireless card, disconnect the antenna that is second from the left.

iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)



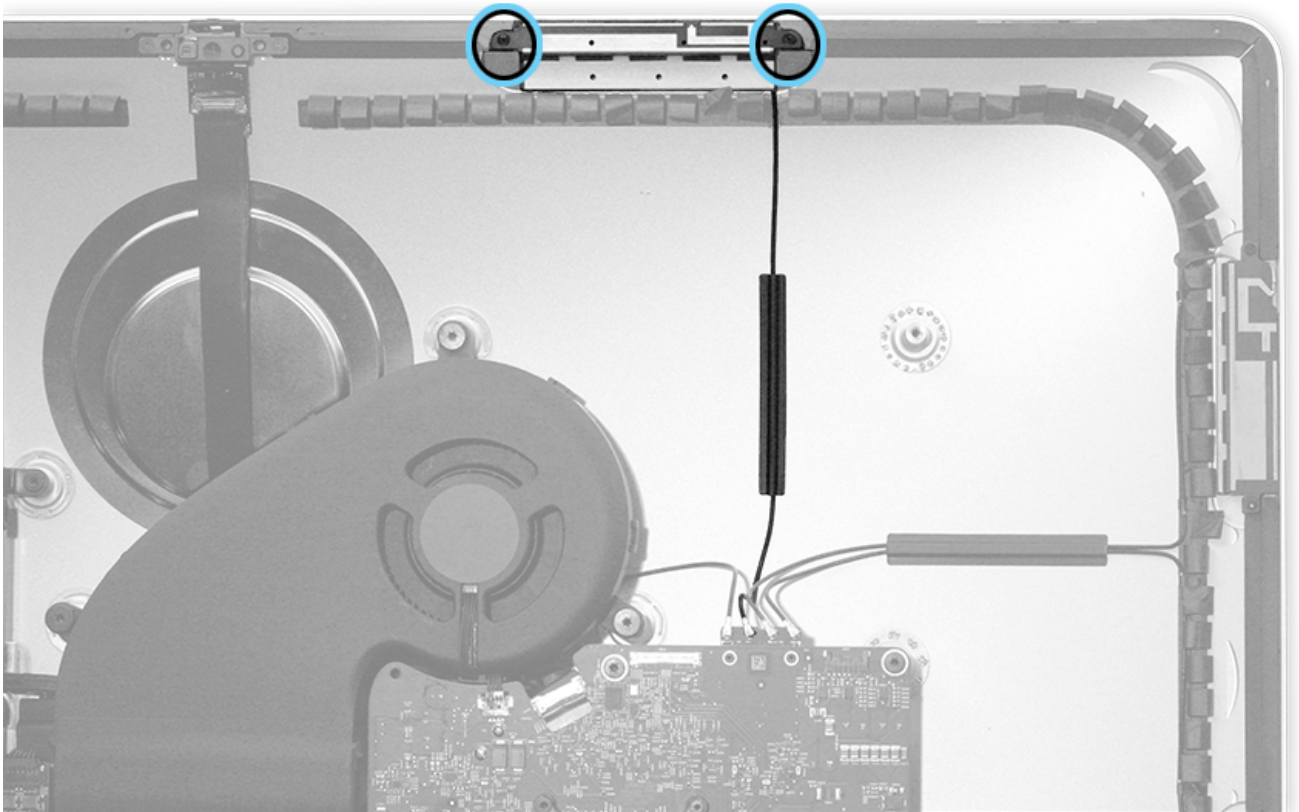
3. Remove two T4 antenna screws.

- 923-0304



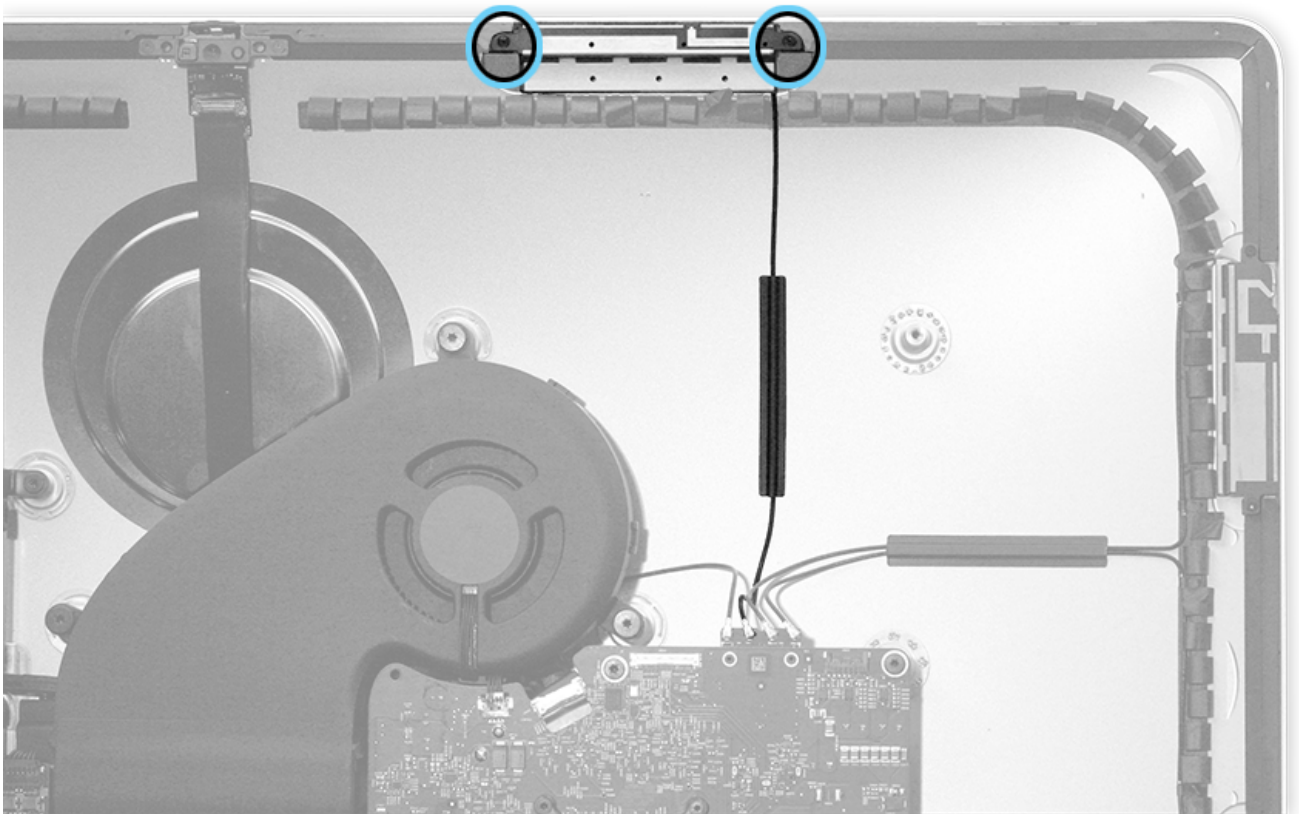
4. With a black stick:

- Peel up the tiny piece of Mylar tape that secures the antenna cable (located within the airloop gasket running alongside the antenna) to the rear housing.
- Pry up the black tape to free the antenna cable from the rear housing.



Steps For Reassembly

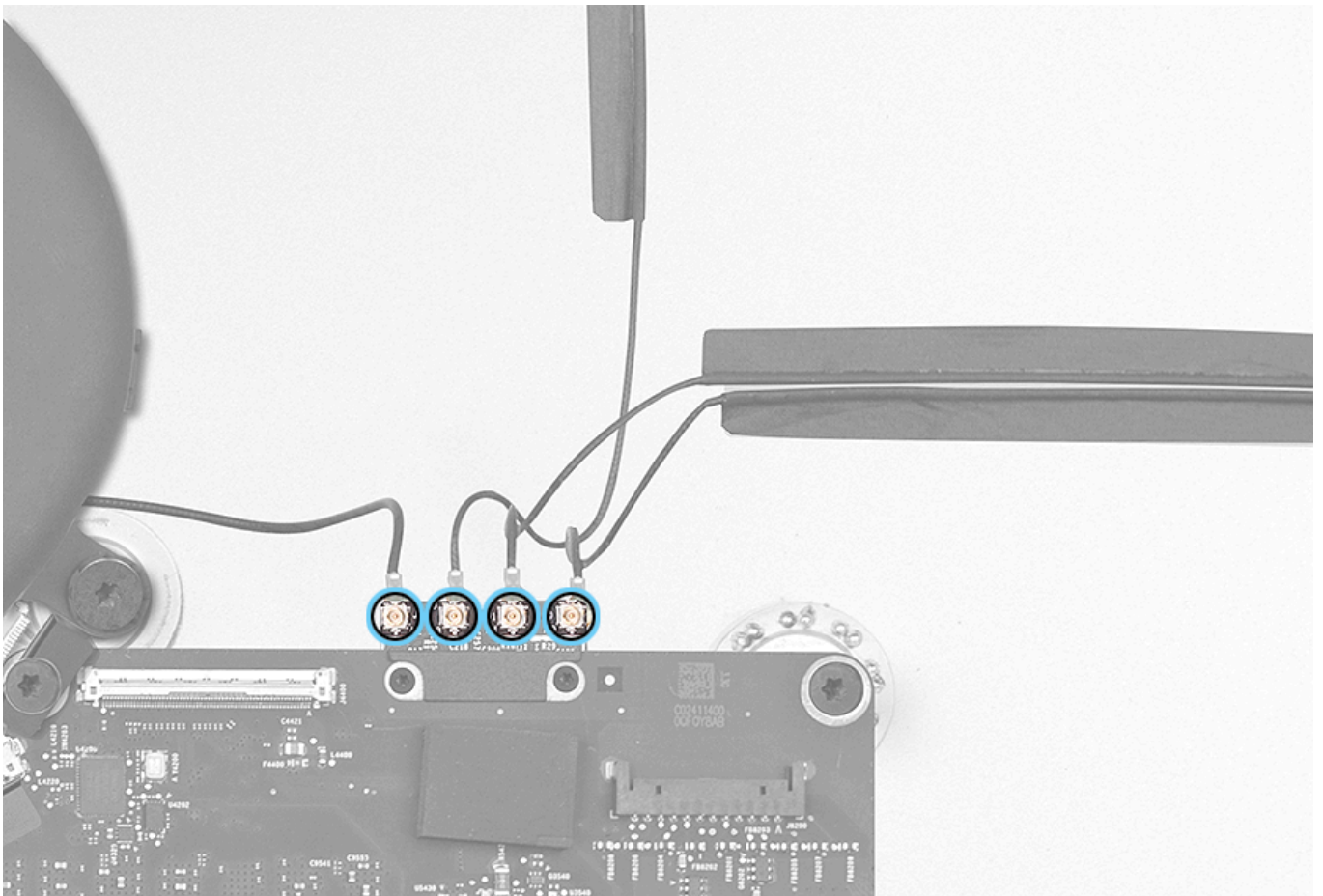
1. Install two antenna screws to the Wi-Fi antenna.
2. Use a black stick to adhere any pieces of Mylar tape located within the airloop gasket that runs alongside the antenna.



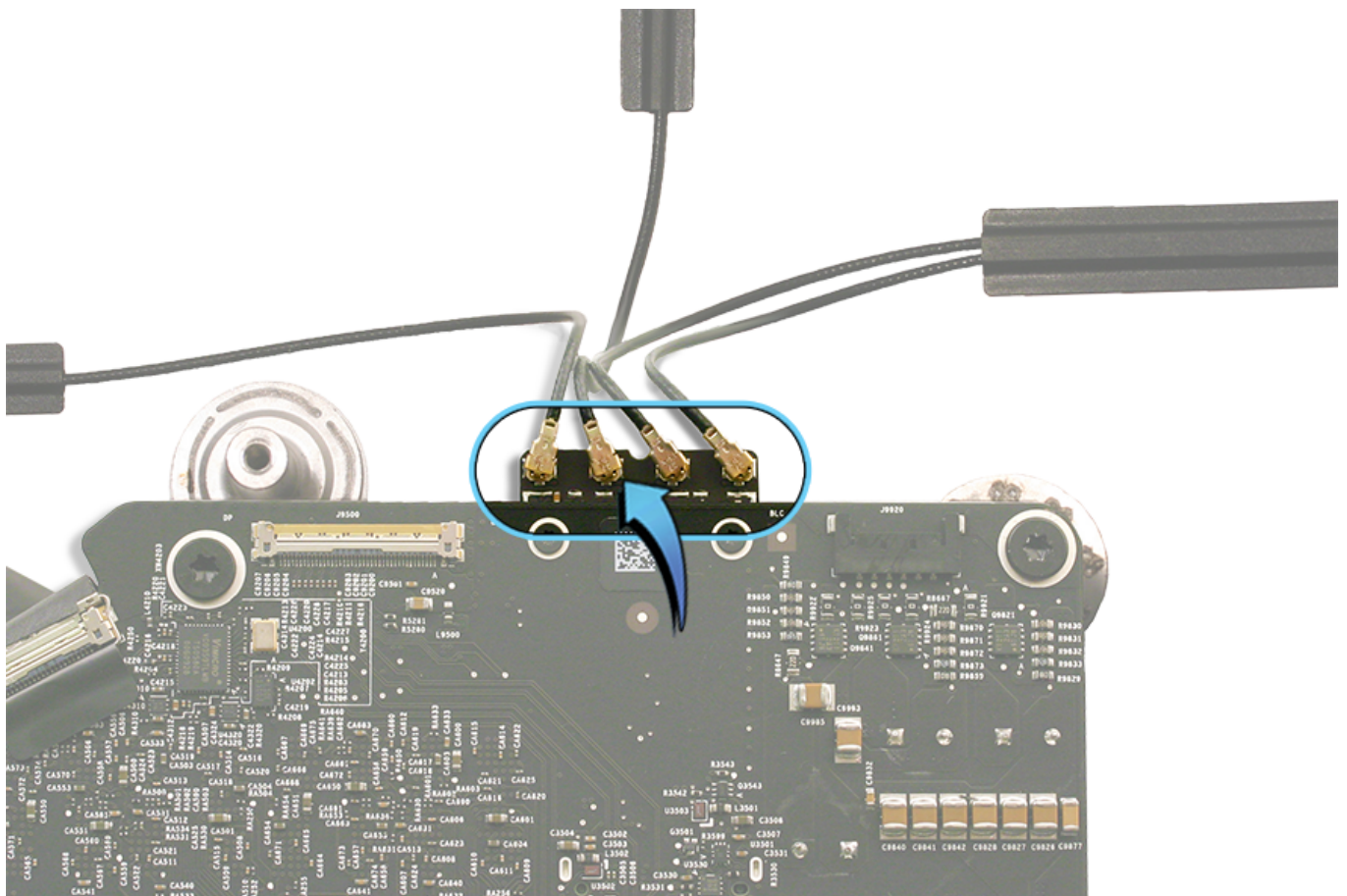
3. Connect the antenna to the second connector from the left on the wireless card.

Note: If installing a replacement antenna, peel the backing off of the Mylar tape and stick the antenna to the rear housing.

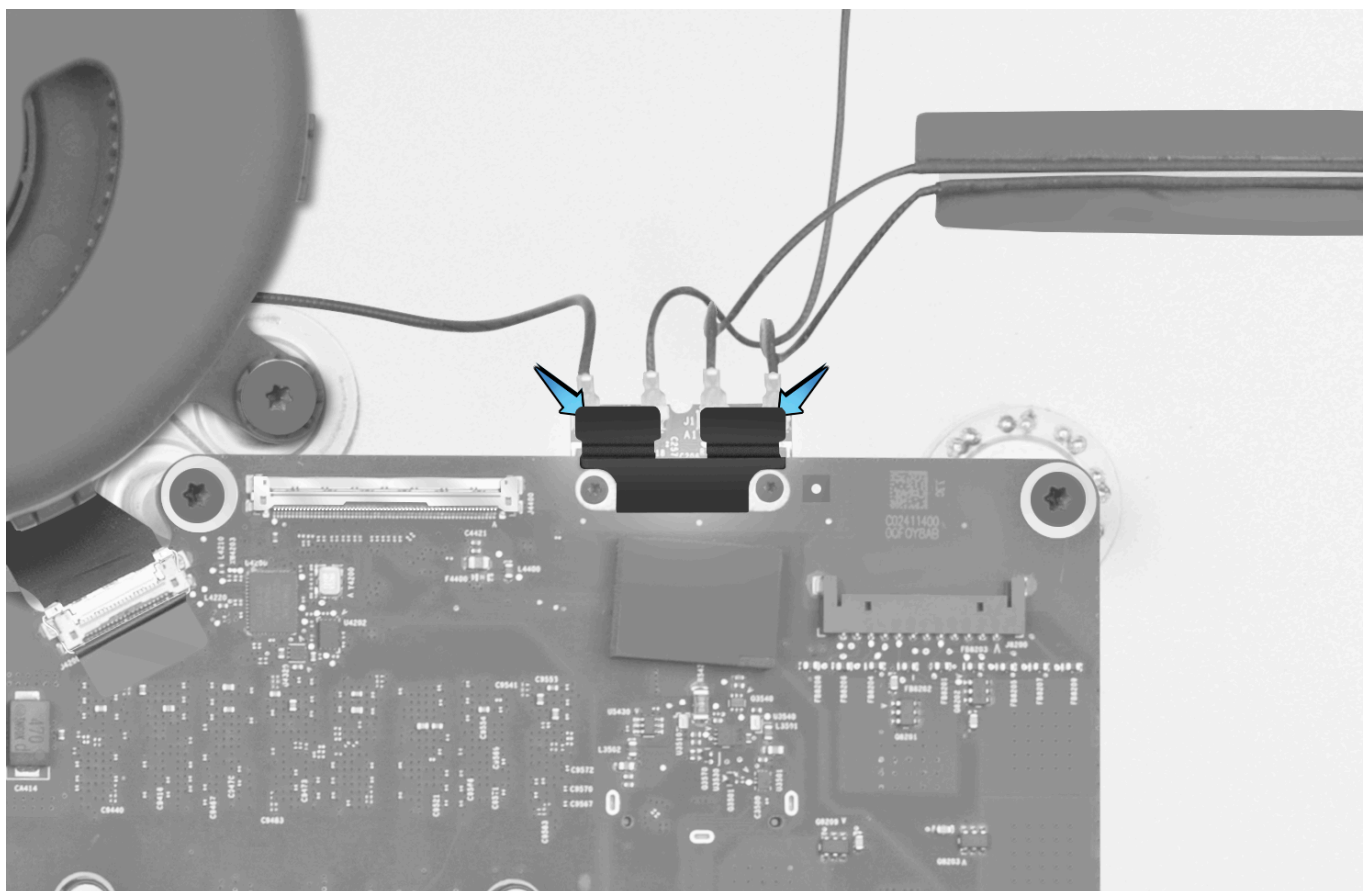
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)



4. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick or your finger to press the Mylar tape onto the antenna cable connectors.



Bluetooth Antenna

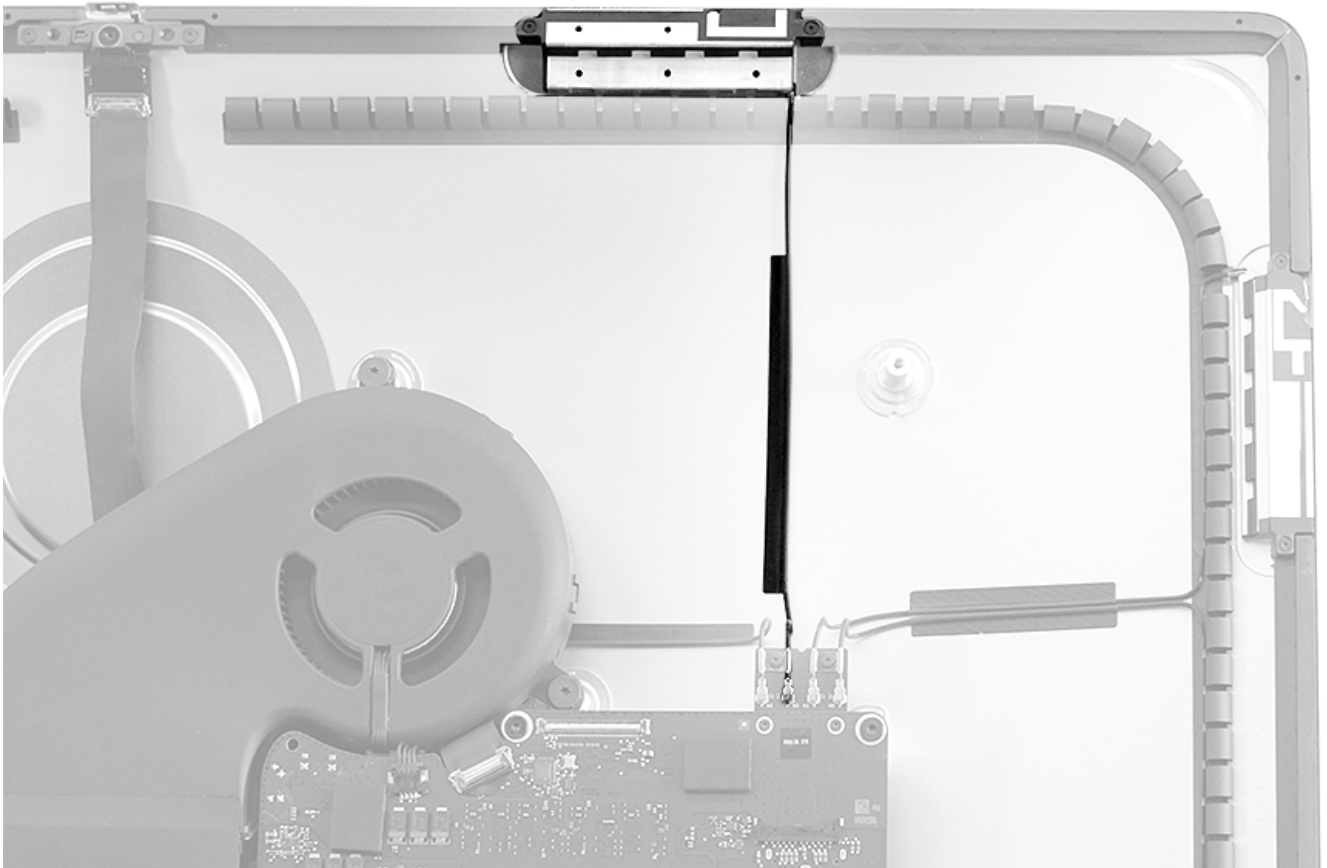
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV294: Bluetooth and Wi-Fi Antenna Replacement Video](#).

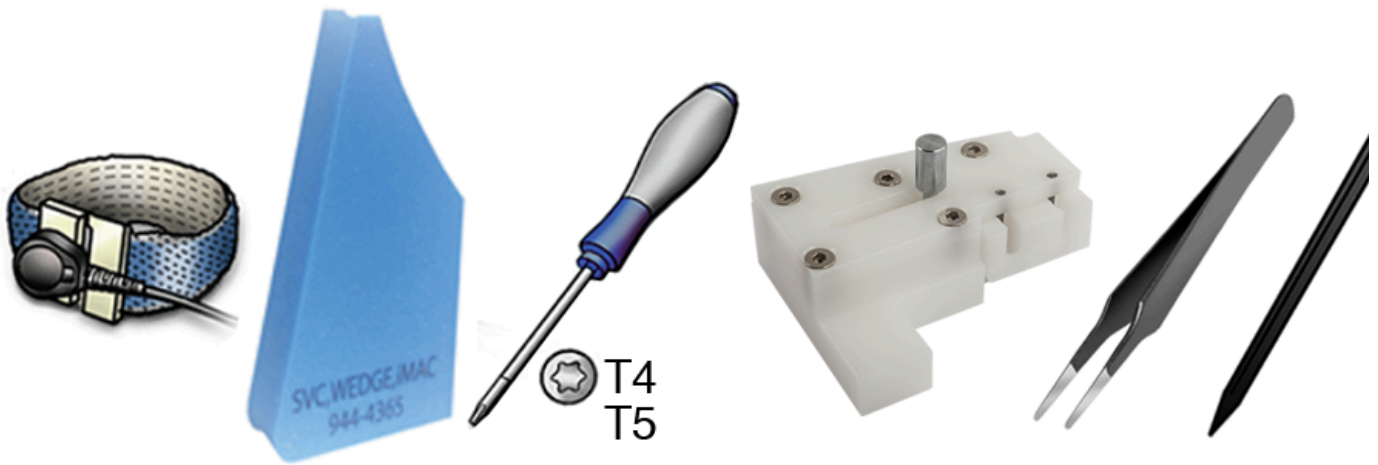
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

- ESD wrist strap and mat
- Service wedge (iMac)
- Torx T4 screwdriver (magnetized)
- Torx T5 screwdriver (magnetized)
- Wireless card support tool (923-00775)
- ESD-safe tweezers
- Black stick

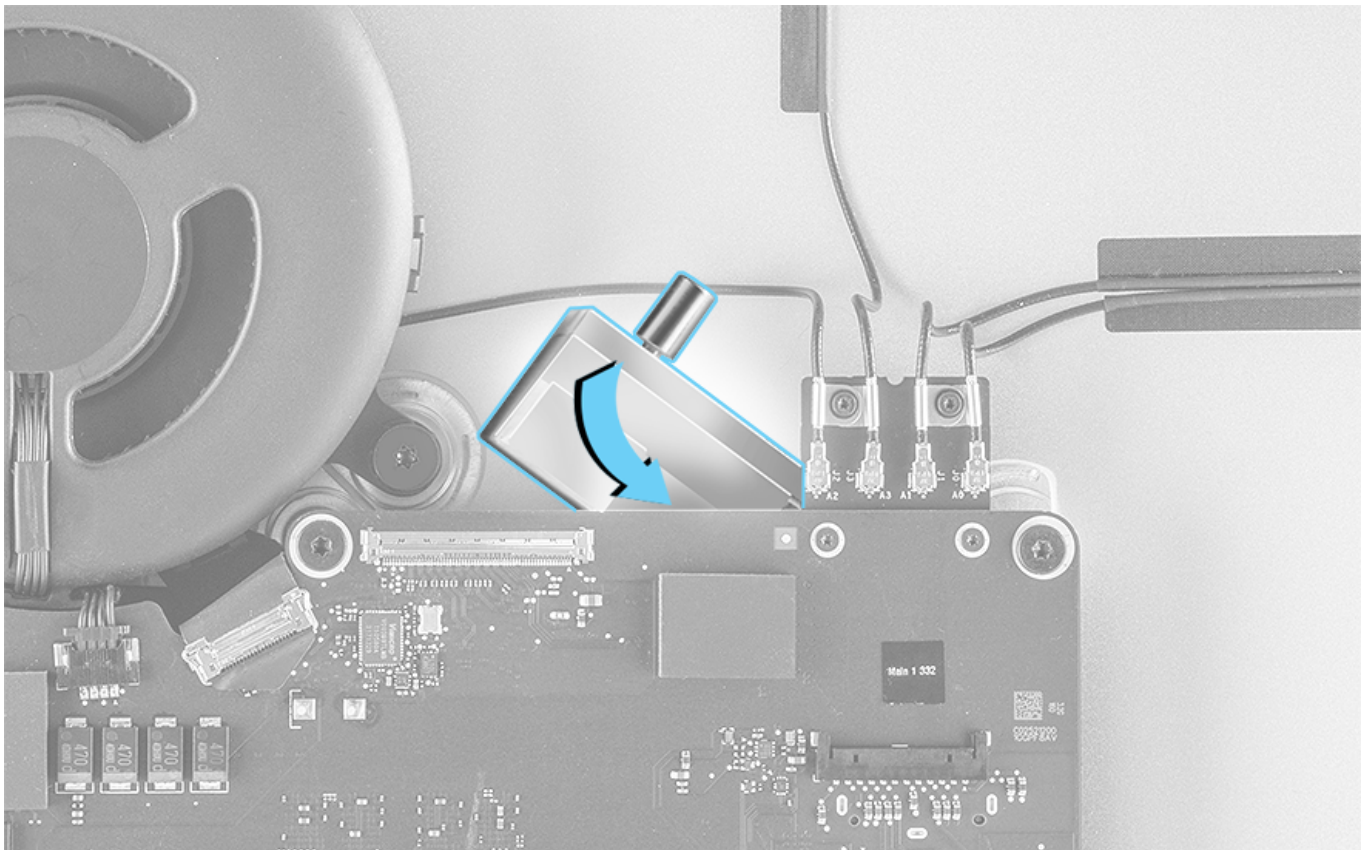


Steps For Removal

Notes:

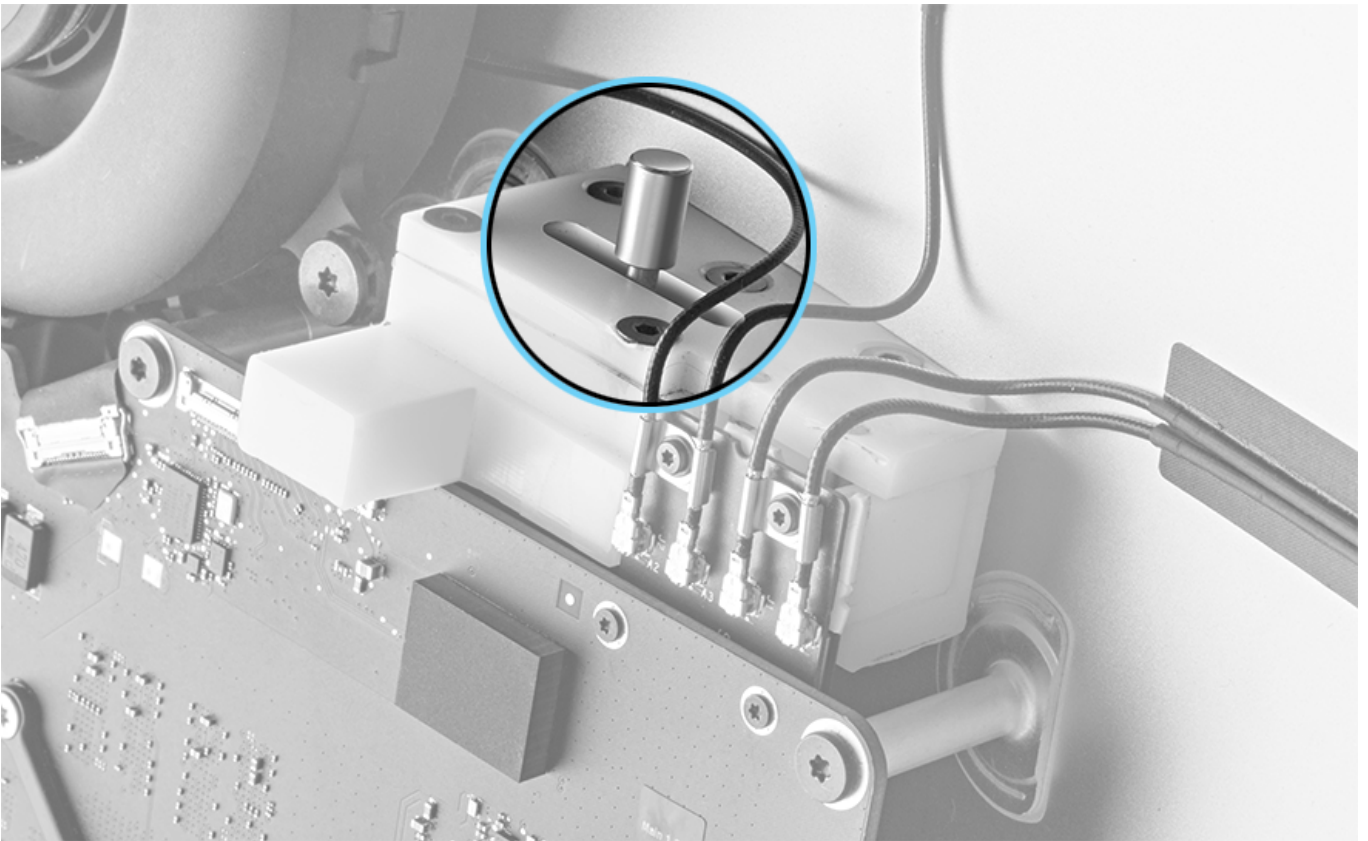
- The iMac has four Wi-Fi/Bluetooth antennas, three of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be replaced by replacing the rear housing.
- The lever on top of the wireless card support tool controls the movement of the block within. Keep the lever to the left when inserting or removing the tool.

1. To protect the wireless card, slide the wireless card support tool into place between the rear housing and the wireless card.

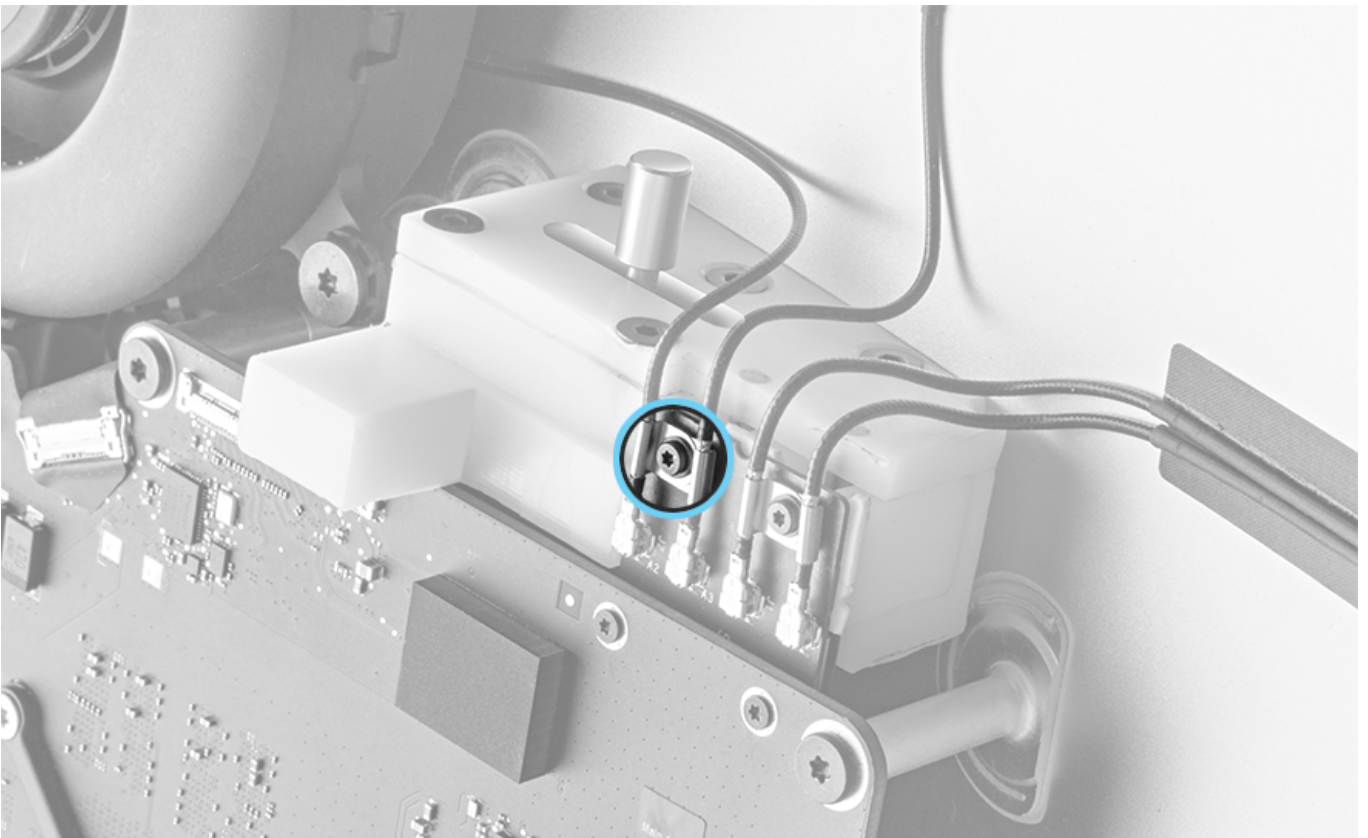


2. Move the lever to the right until the inner block presses against the wireless card.

When positioned correctly, the support tool is held firmly in place and cannot be shifted. Keep the support tool in position while removing or replacing screws and when disconnecting or reconnecting antenna cables.

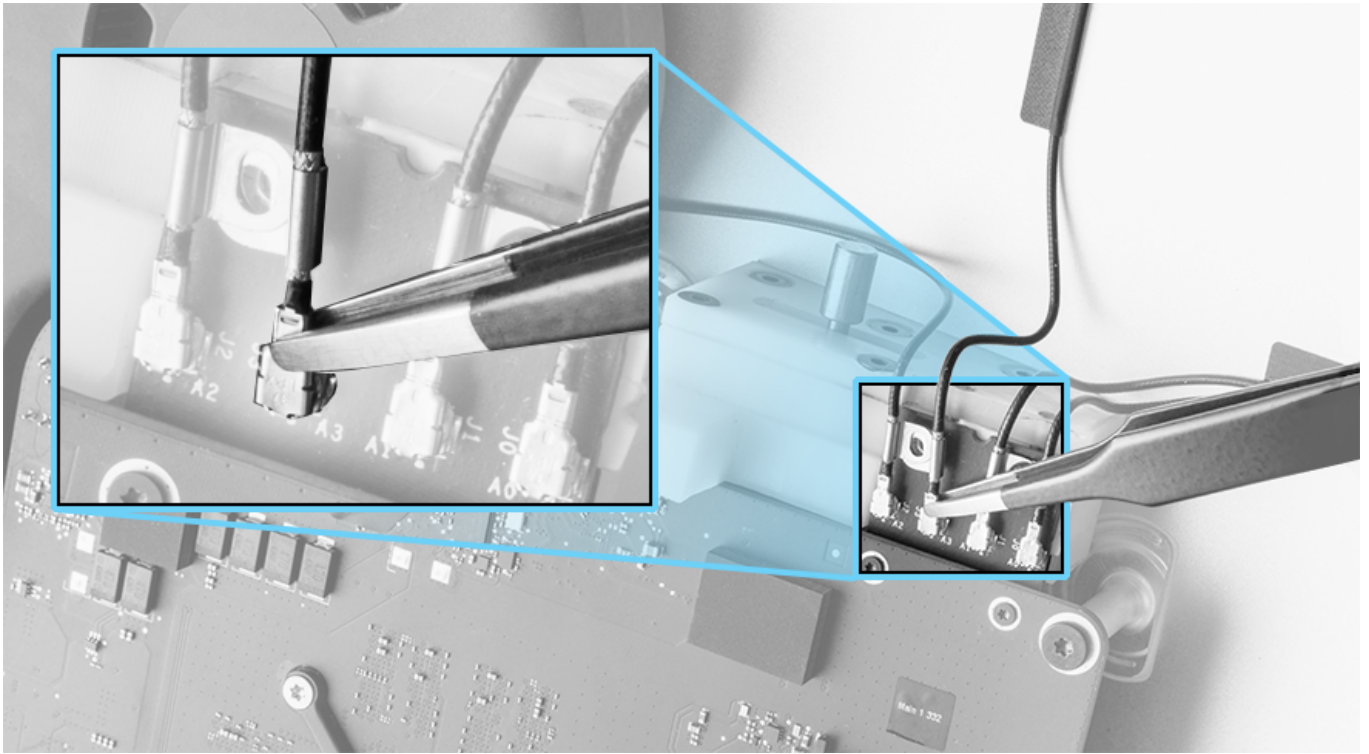


3. Remove the 3.8 mm T5 (923-00609) screw and washer from the wireless card.

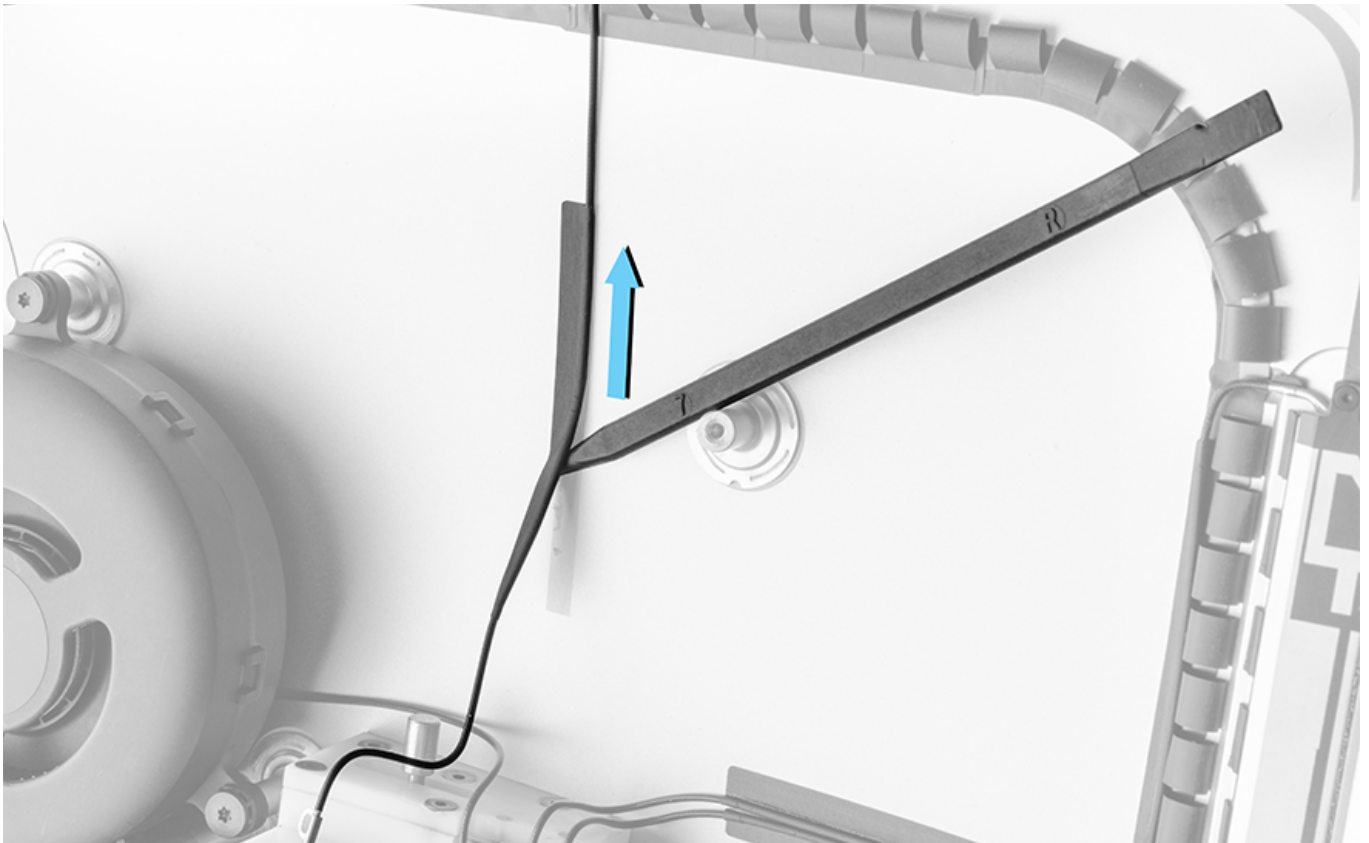


4. Use ESD-safe tweezers to disconnect the connector from the wireless card.

Note: Avoid using a metal tool that could crimp or damage the cable.



5. Use a black stick to gently unroute the cable and its tape from the rear housing.



6. Remove two T4 (923-0304) screws that secure the antenna body to the rear housing.



7. Remove the Bluetooth antenna from the computer assembly.



Steps For Reassembly

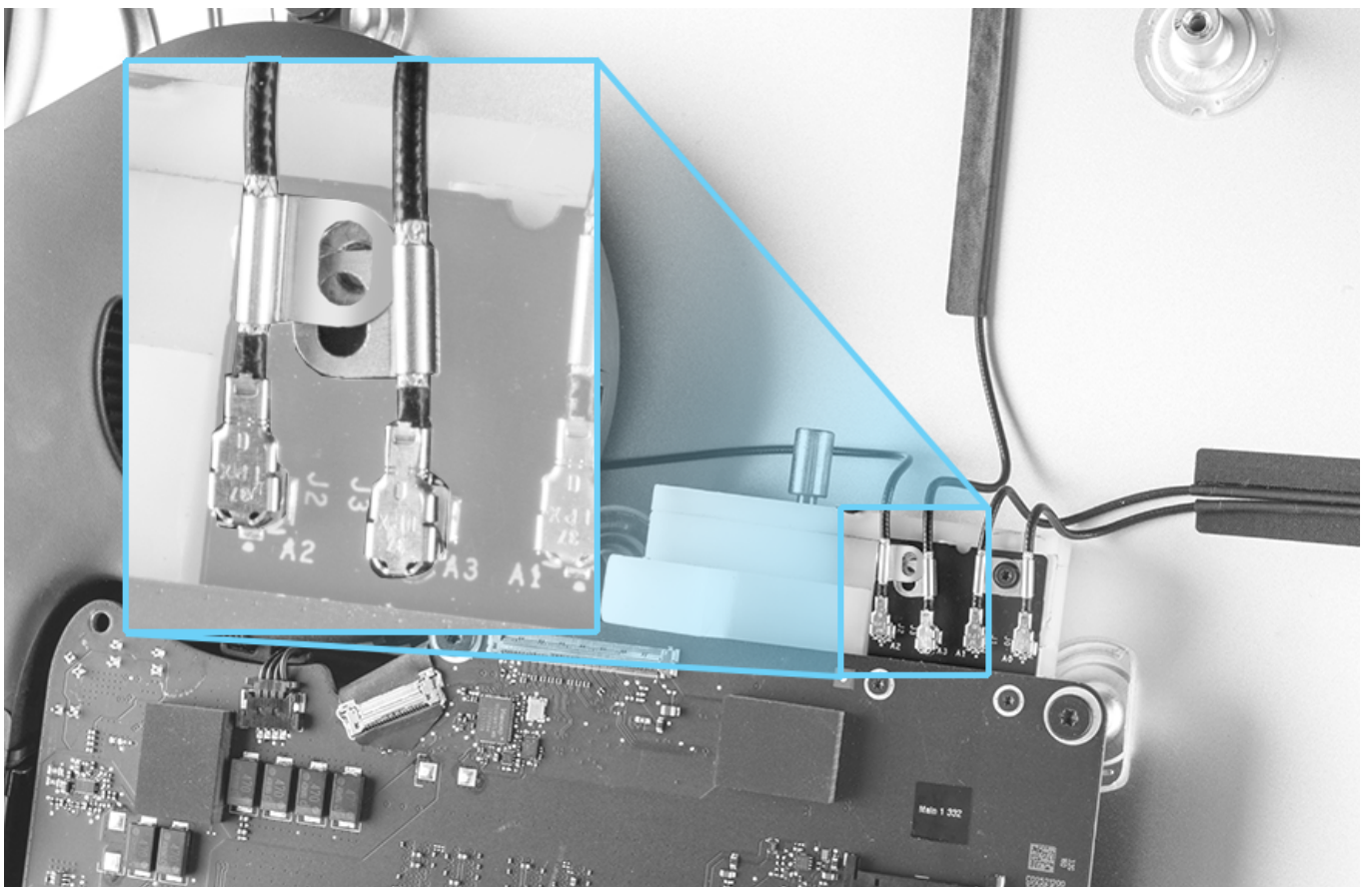
1. Install two T4 (923-0304) screws to secure the antenna body to the rear housing.



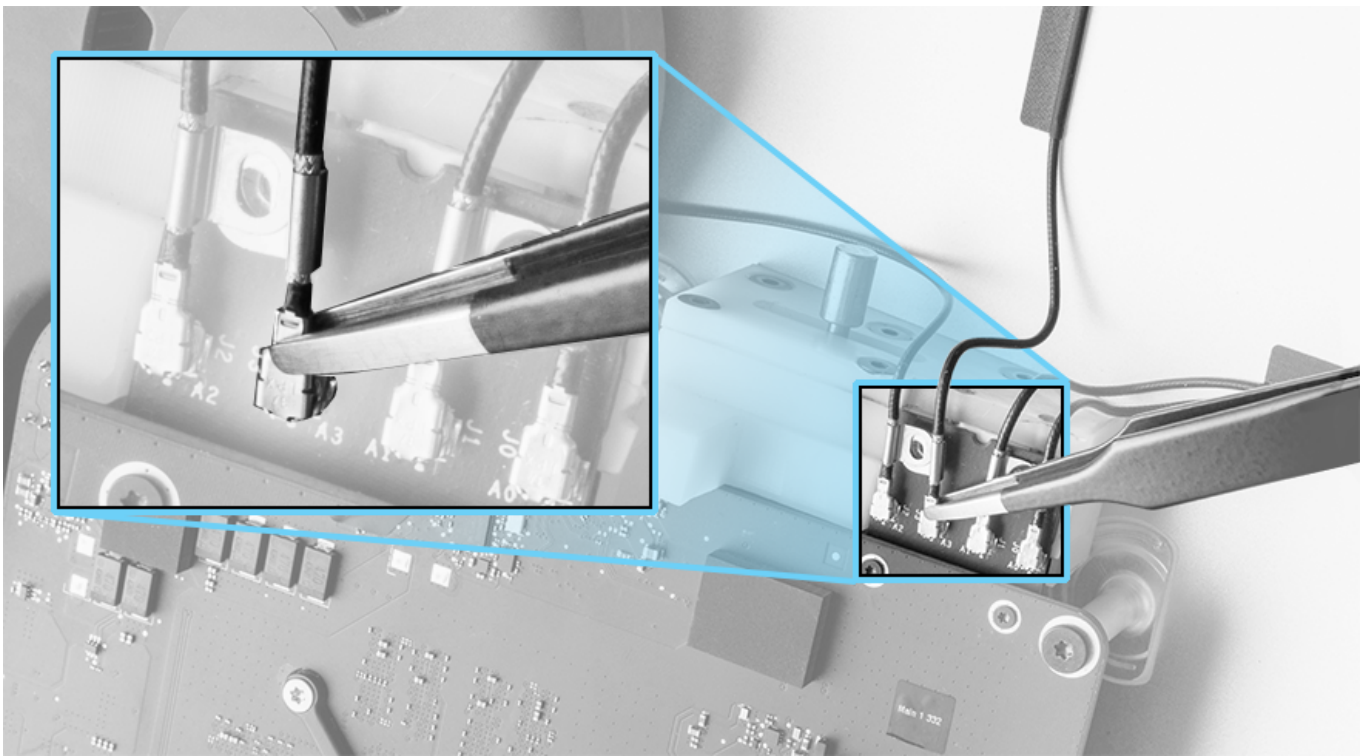
2. Route the antenna cable to the housing. Use the flat end of a black stick to secure the tape.



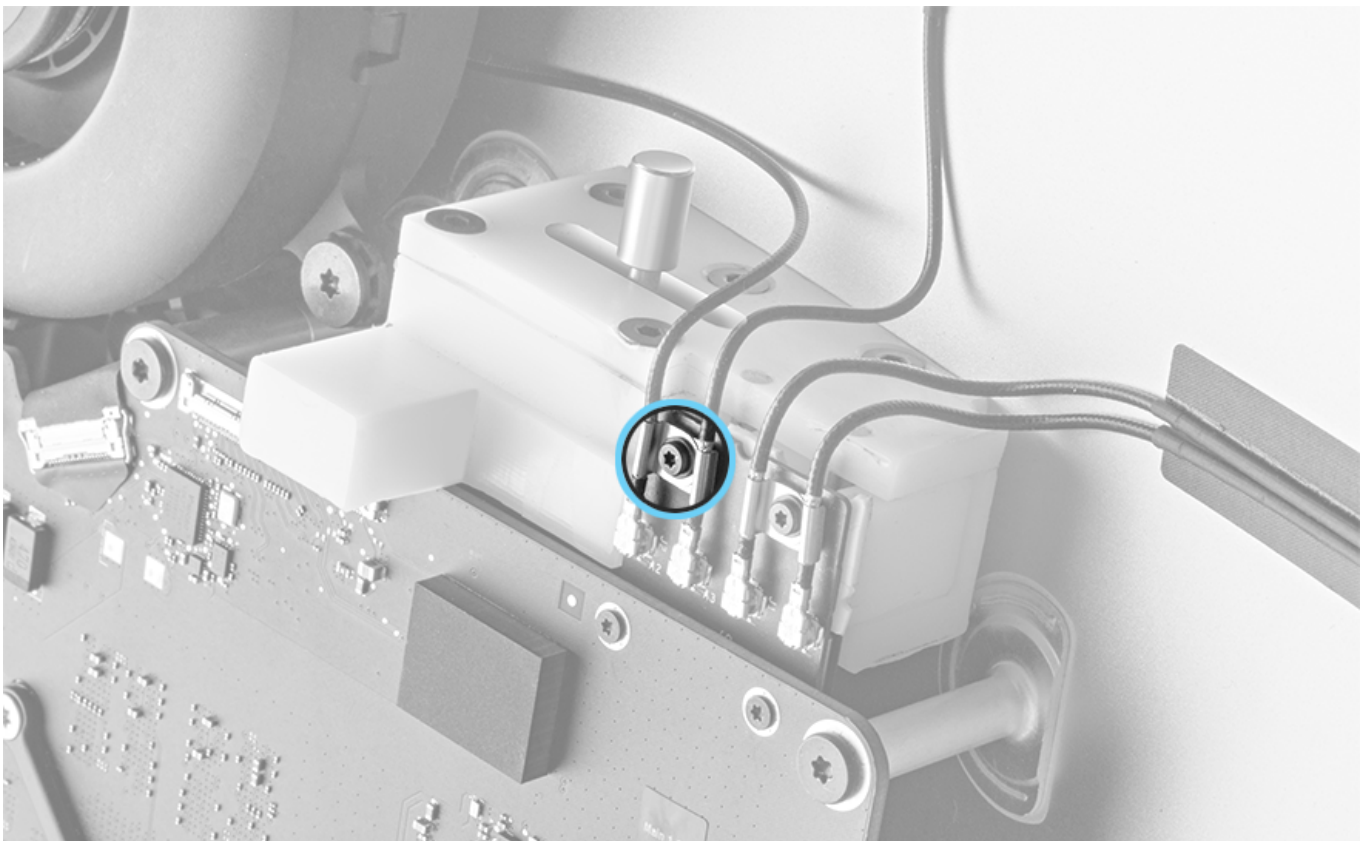
3. Slide the right bracket under the left bracket.



4. Use ESD-safe tweezers to connect the cable to the wireless card.

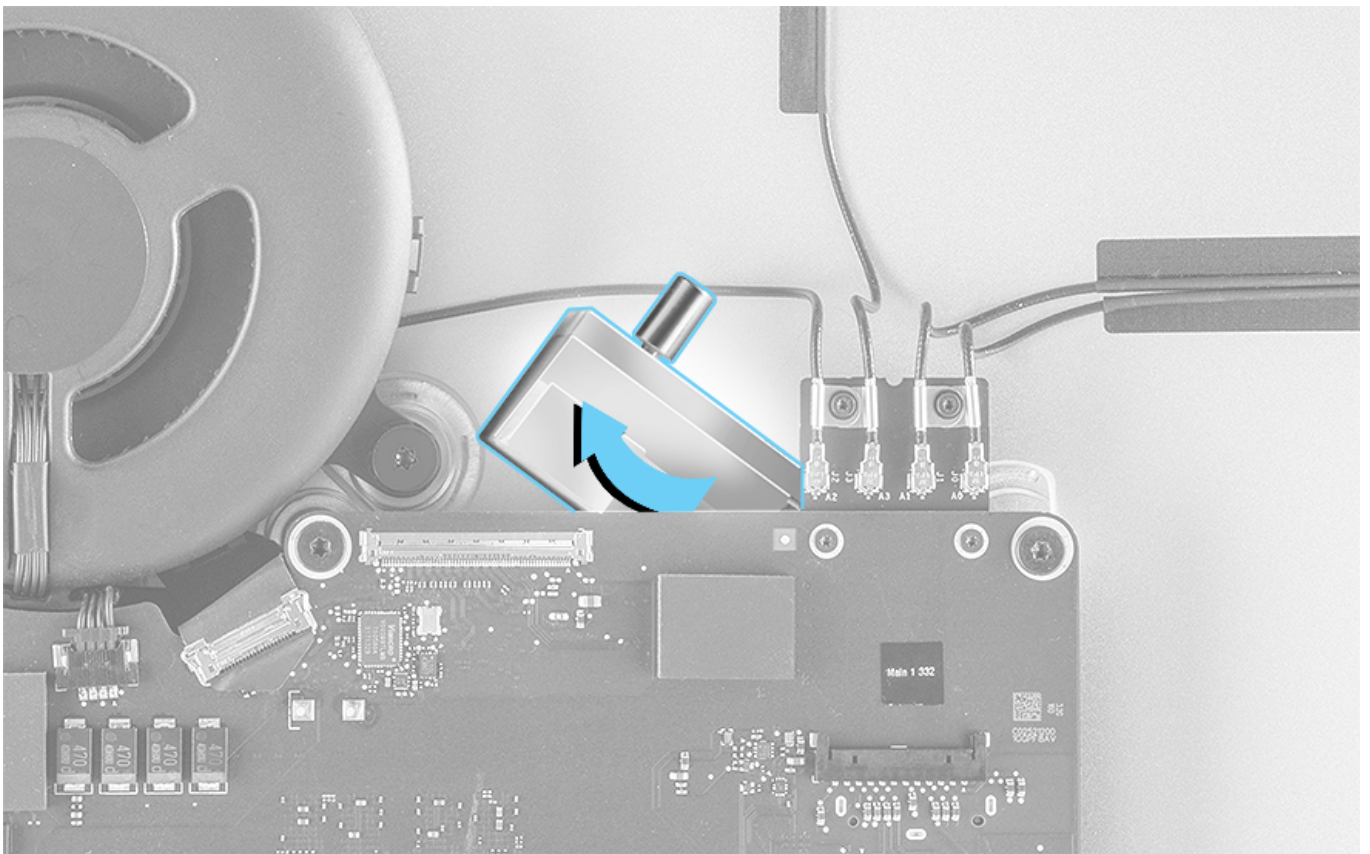


5. Install the 3.8 mm T5 (923-00609) screw and the washer to the wireless card.

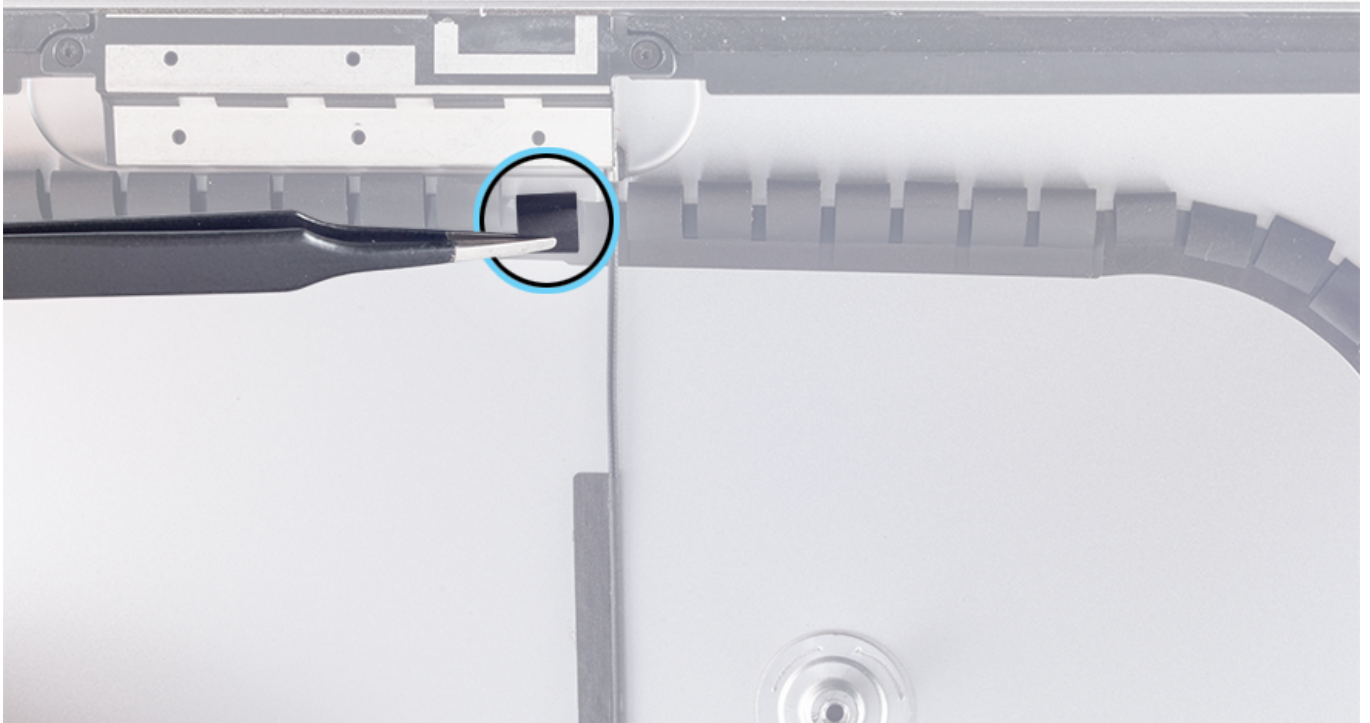


6. Move the lever on the support tool to the left.

7. Remove the support tool from the rear housing.



8. Check the airloop gasket and use a black stick or tweezers to open any flattened loops.



9. Reinstall the [right speaker](#).

10. Reinstall the [chin strap](#).

11. Install new [display panel VHB strips](#).

12. Reinstall the [display panel](#).

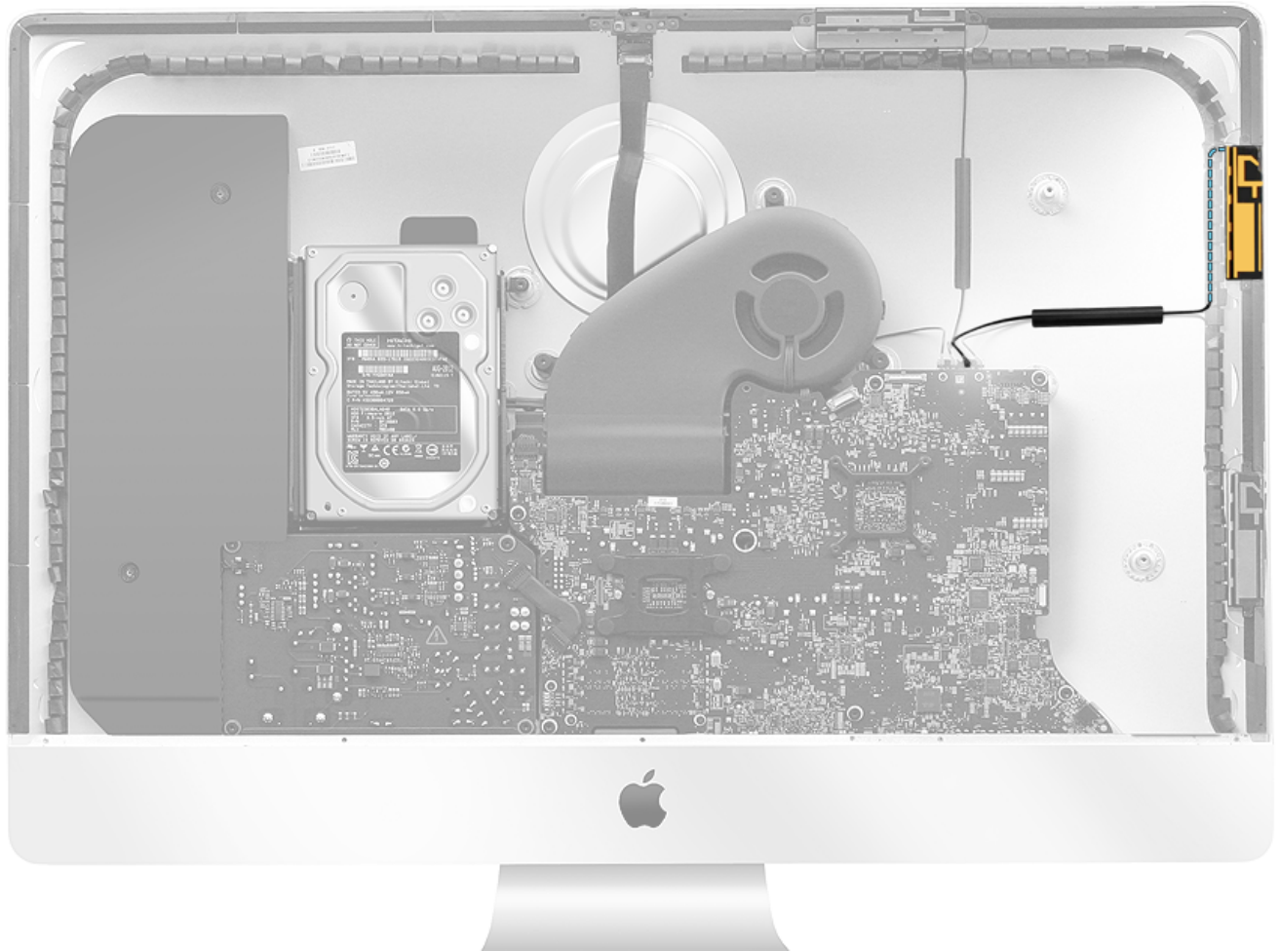
Wi-Fi Antenna, Mid

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

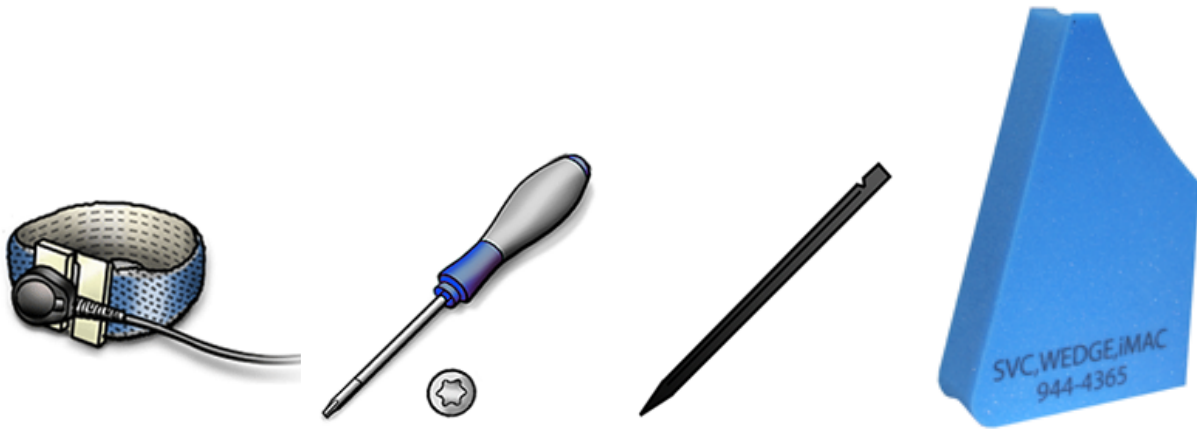
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

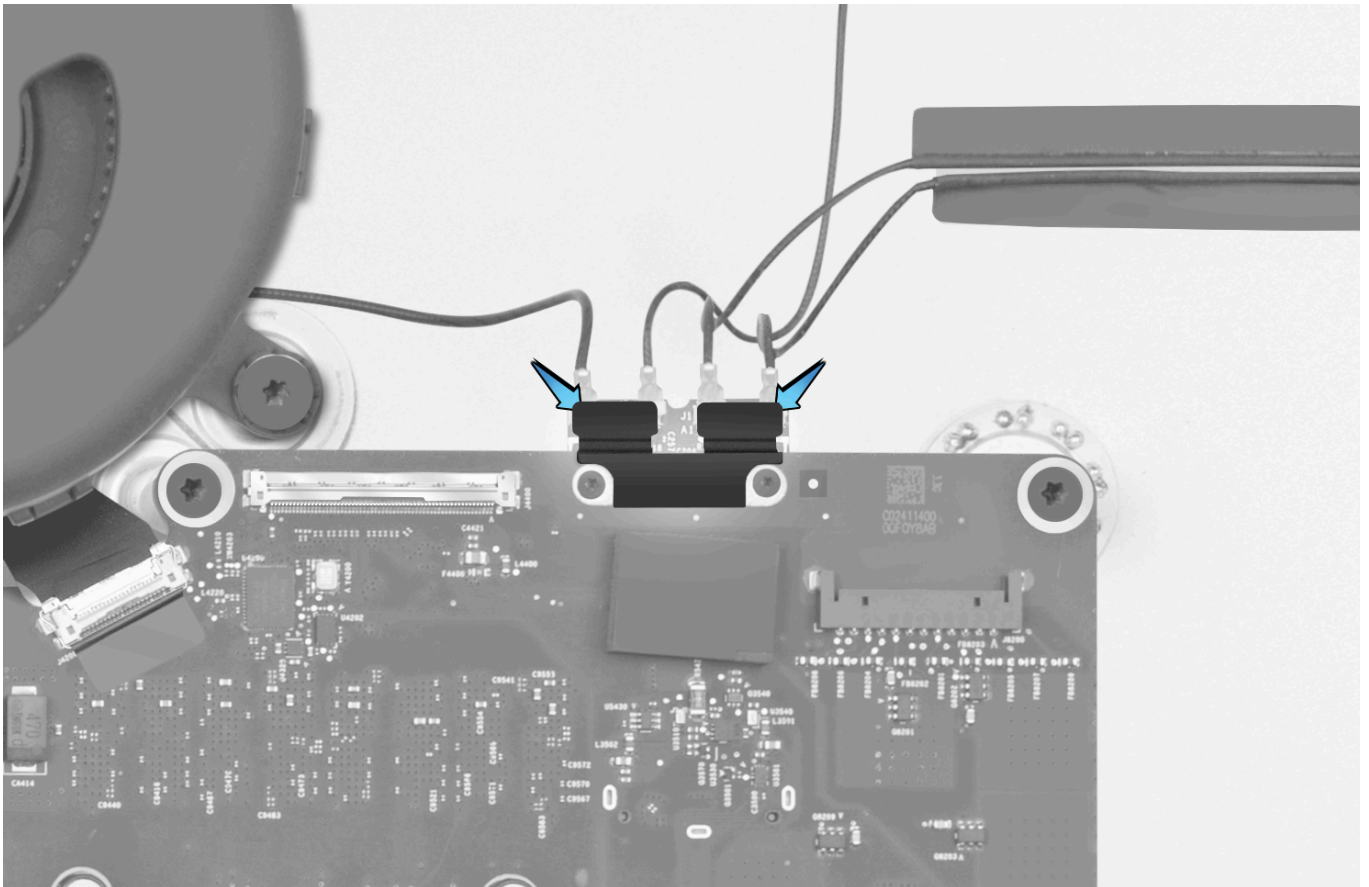
- ESD wrist strap and mat
- Torx T4 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)



Steps For Removal

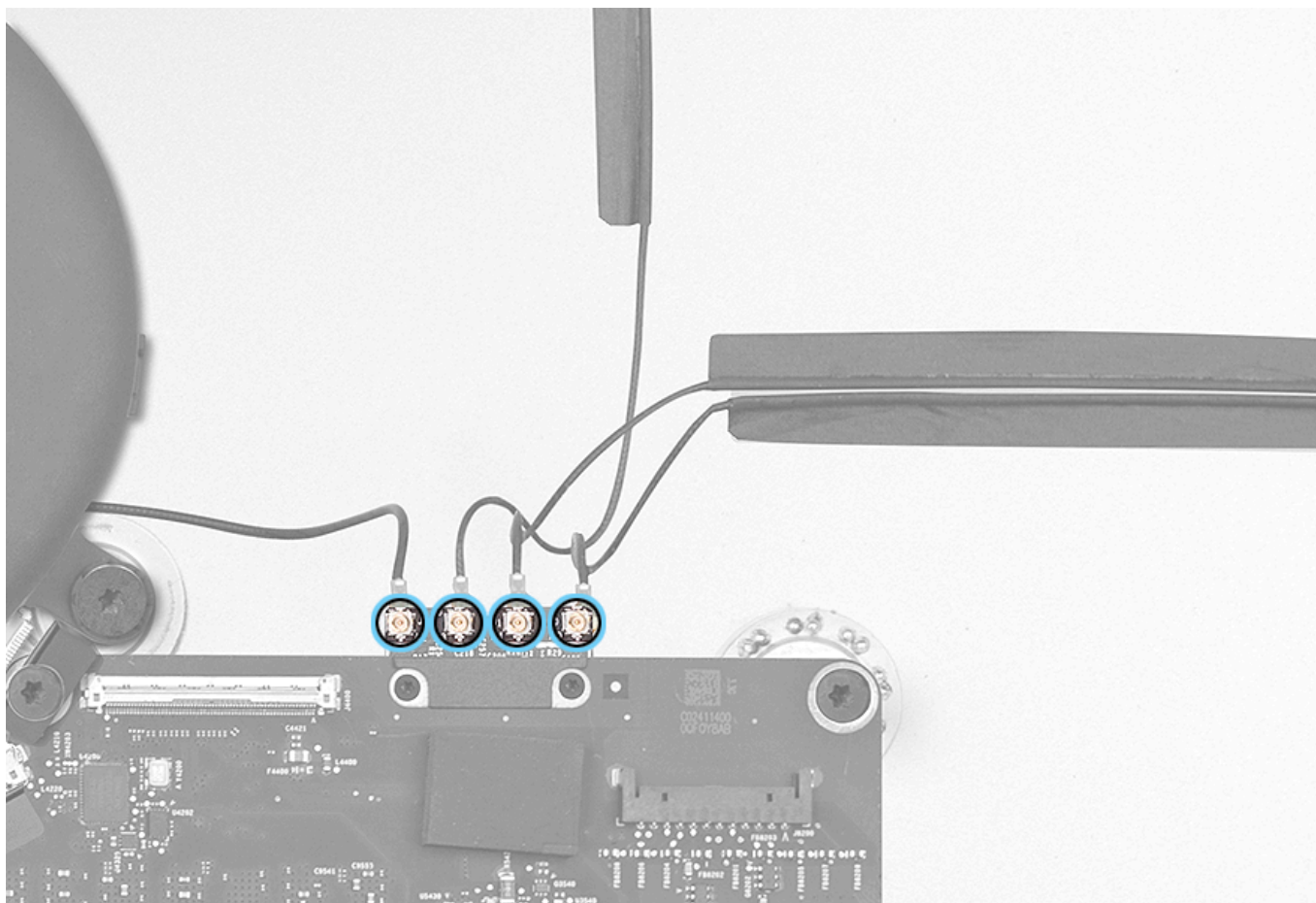
Note: The Mac has four Wi-Fi/Bluetooth antennas, three of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be replaced by replacing the rear housing.

1. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick to flip down the tape that covers the antenna cable connectors.

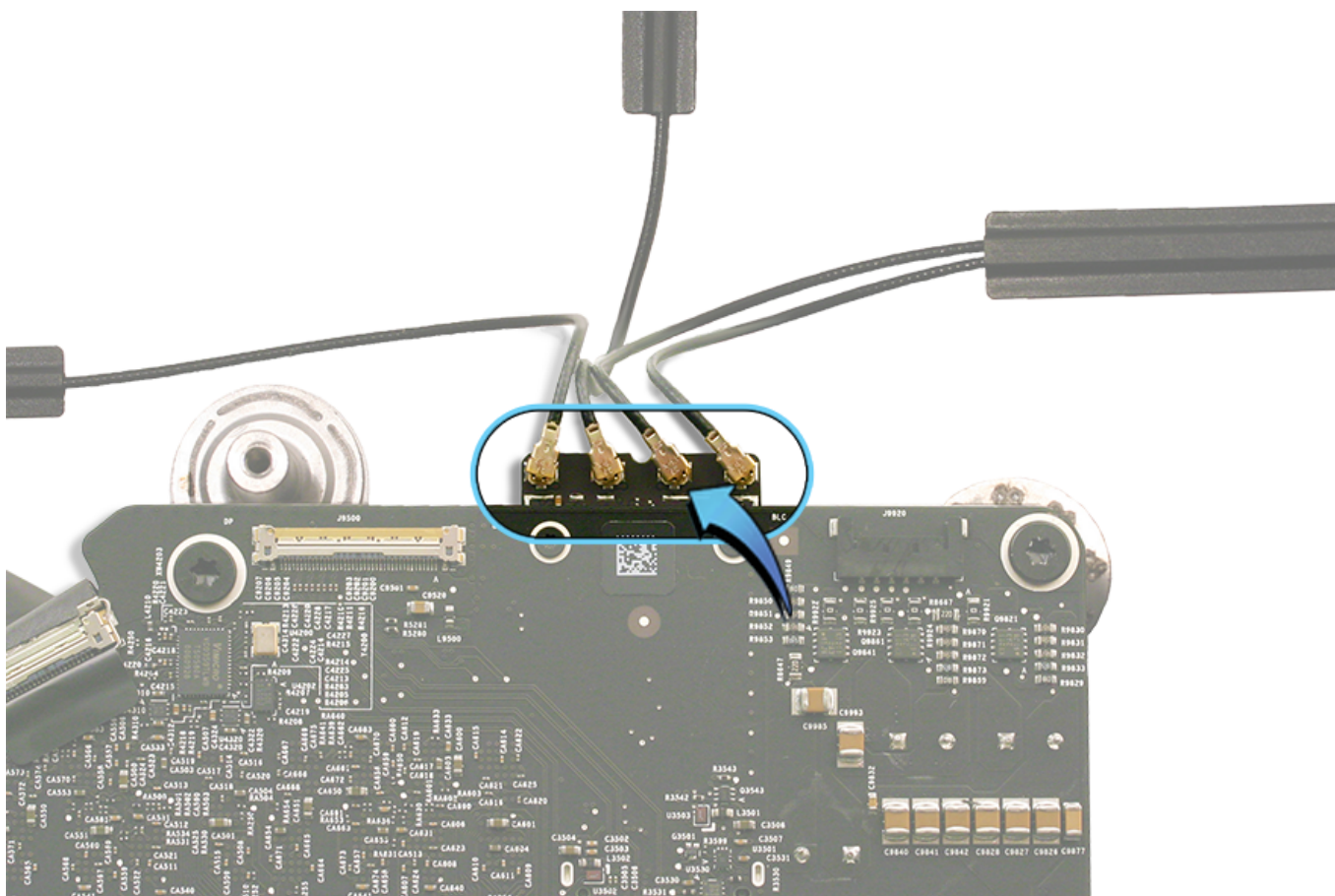


2. On the wireless card, disconnect the antenna that is second from the right.

iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)



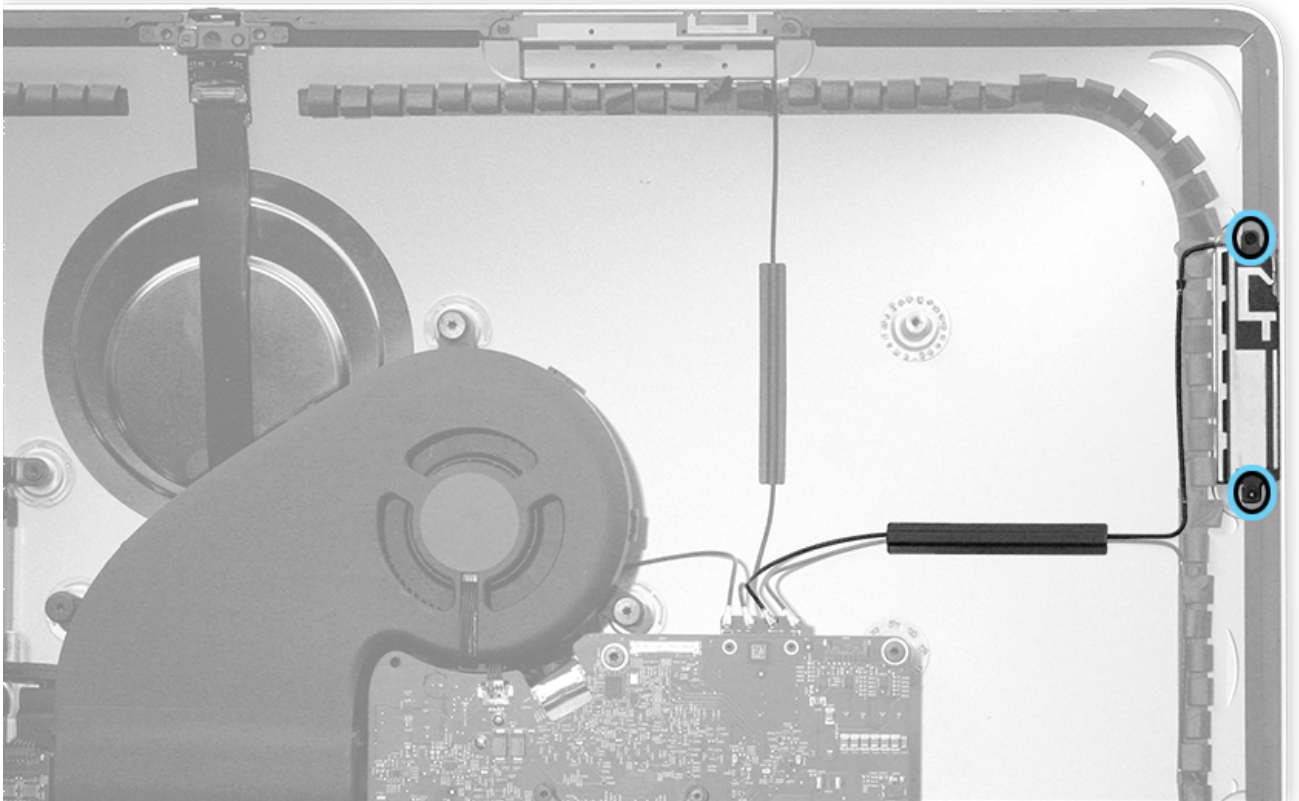
3. Remove two T4 antenna screws.

- 923-0304



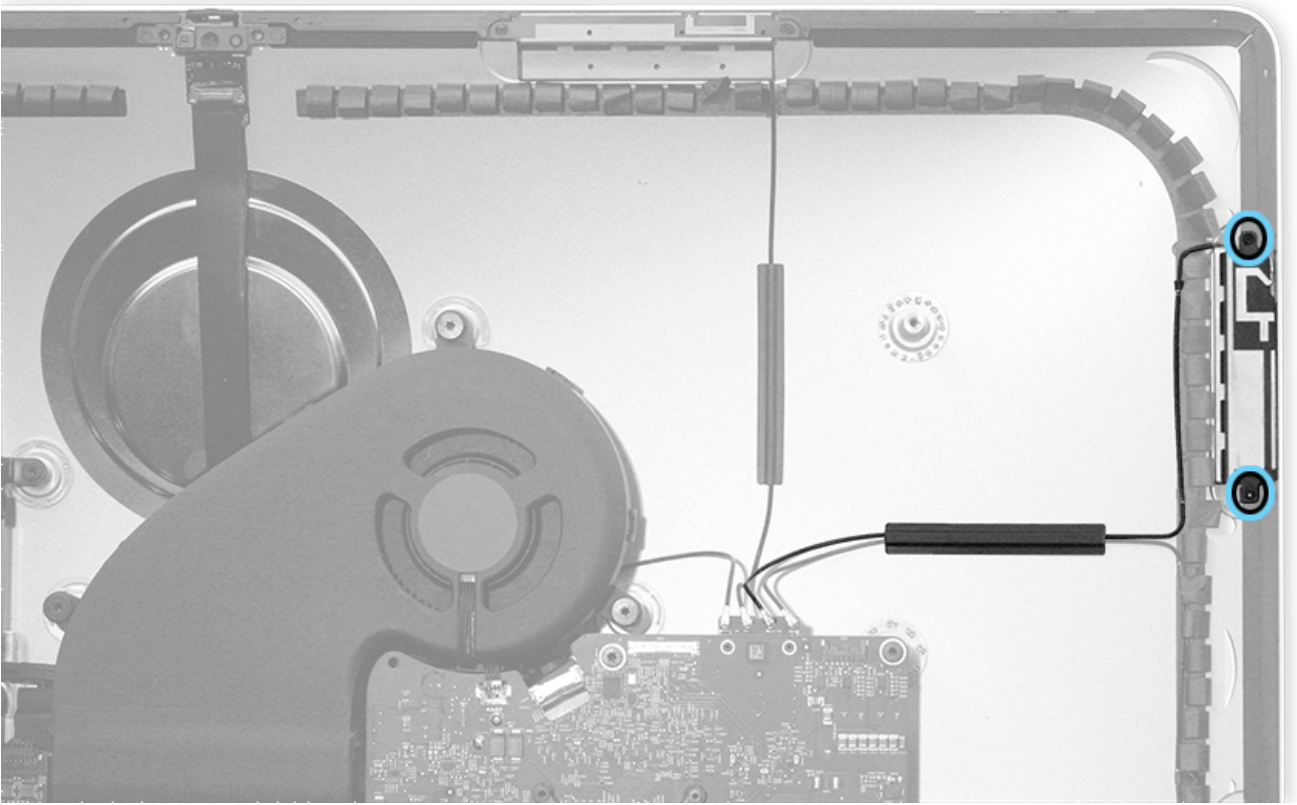
4. With a black stick:

- Peel up the tiny piece of Mylar tape that secures the antenna cable (located within the airloop gasket running alongside the antenna) to the rear housing.
- Pry up the black tape to free the antenna cable from the rear housing.



Steps For Reassembly

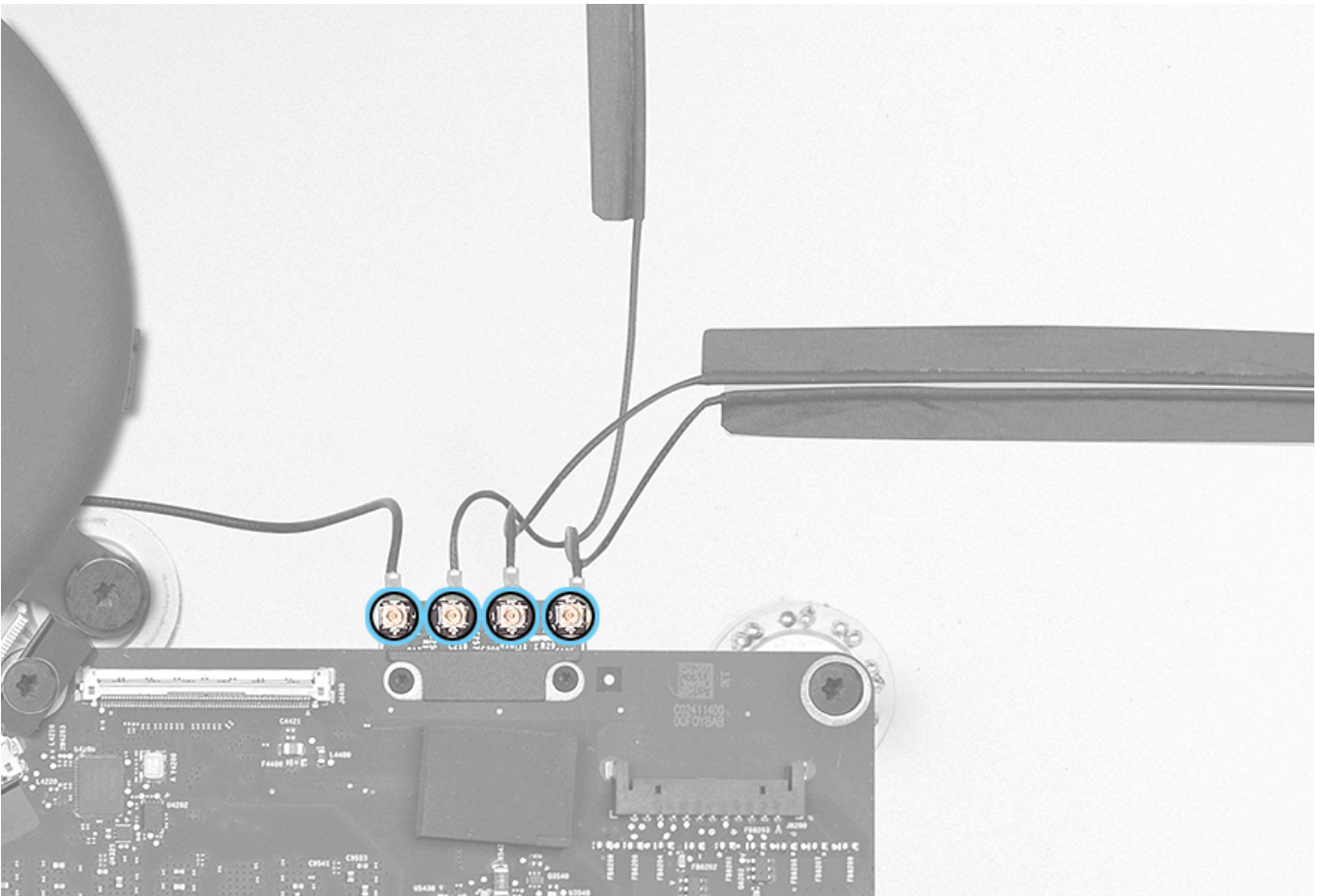
1. Install two antenna screws to the Wi-Fi antenna.
2. Use a black stick to adhere any pieces of Mylar tape located within the airloop gasket that runs alongside the antenna.



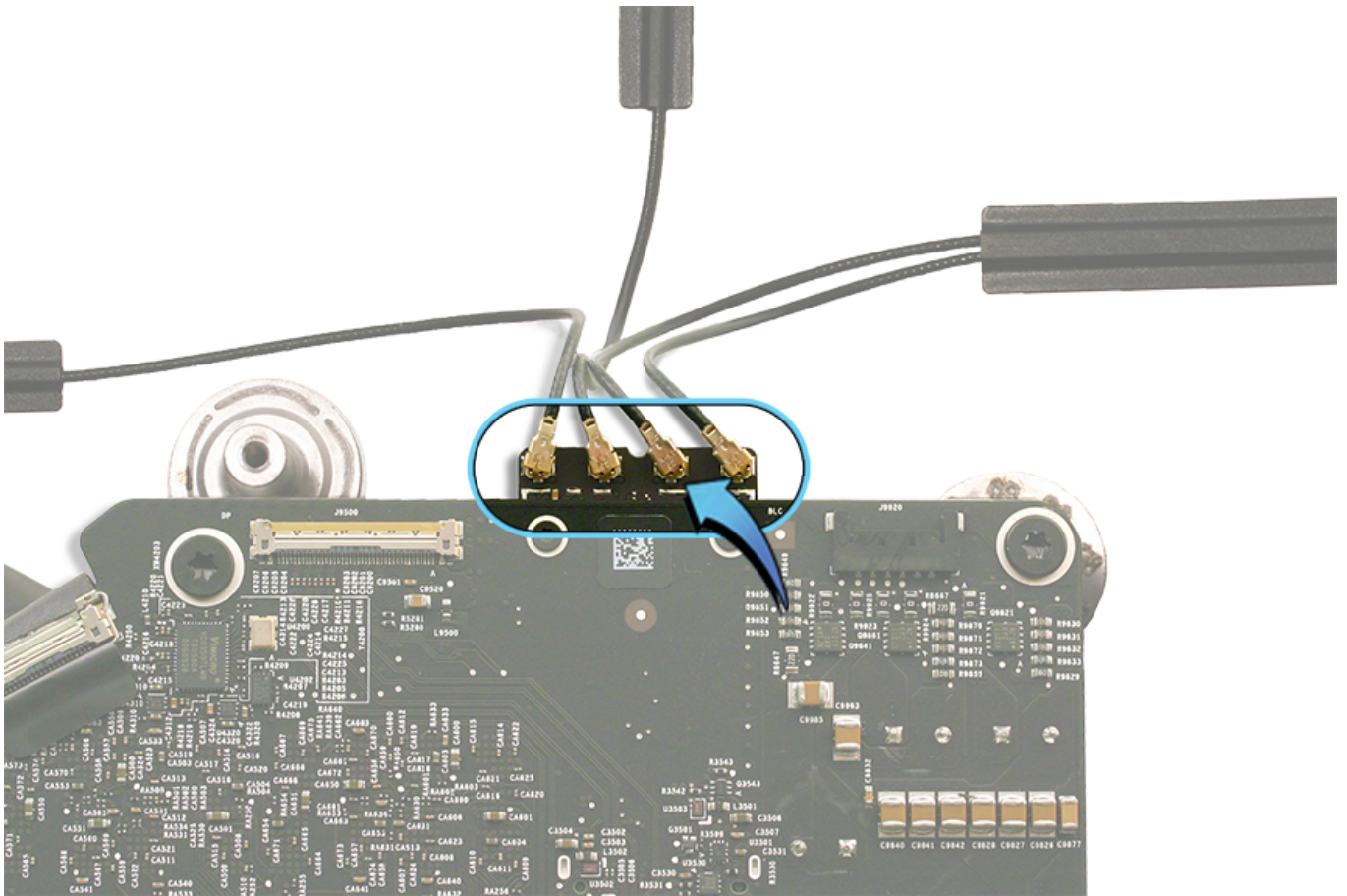
3. Connect the antenna to the second connector from the right on the wireless card.

Note: If installing a replacement antenna, peel the backing off of the Mylar tape and stick the antenna to the rear housing.

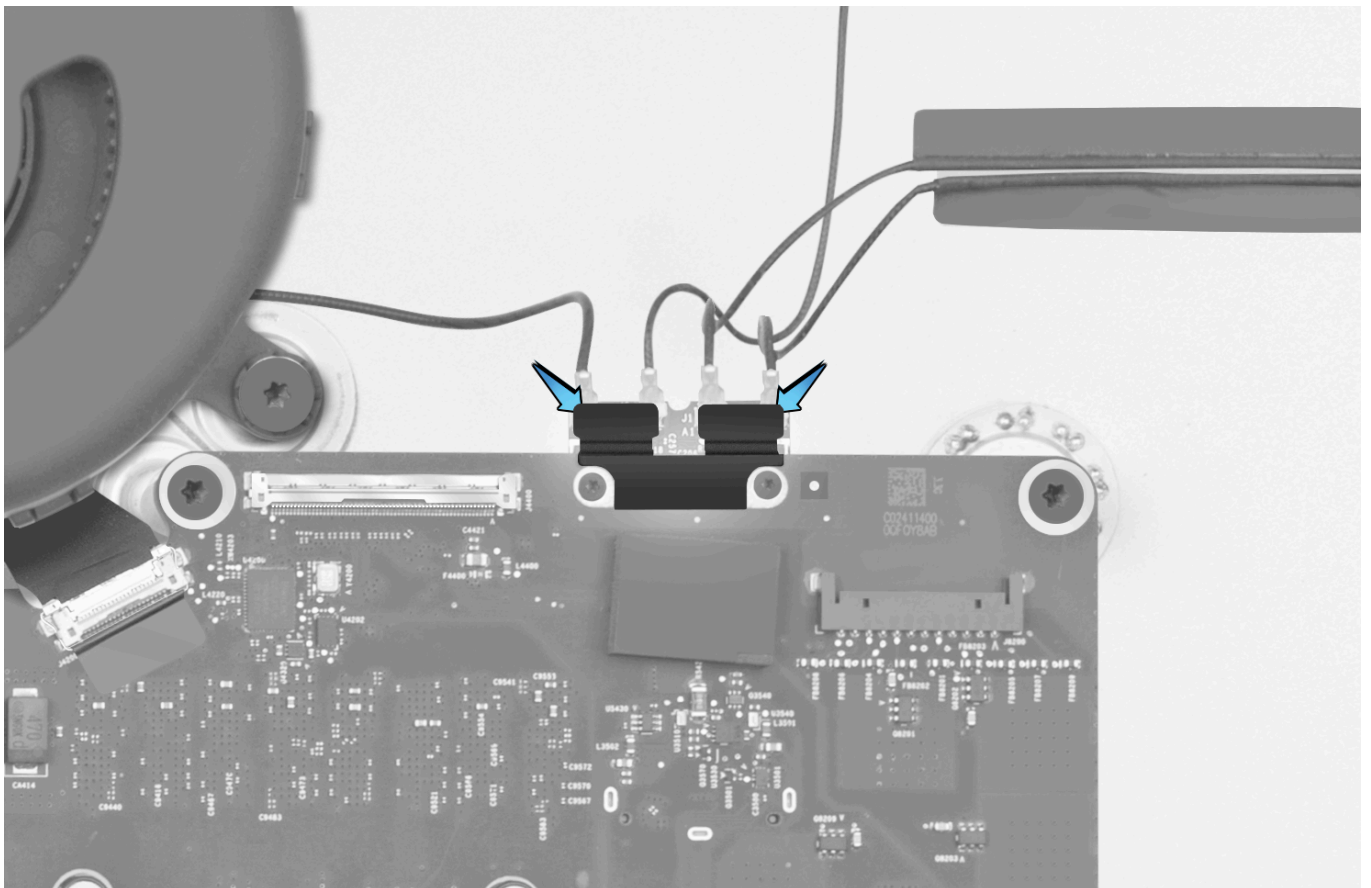
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)



4. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick or your finger to press the Mylar tape onto the antenna cable connectors.



Middle Wi-Fi Antenna

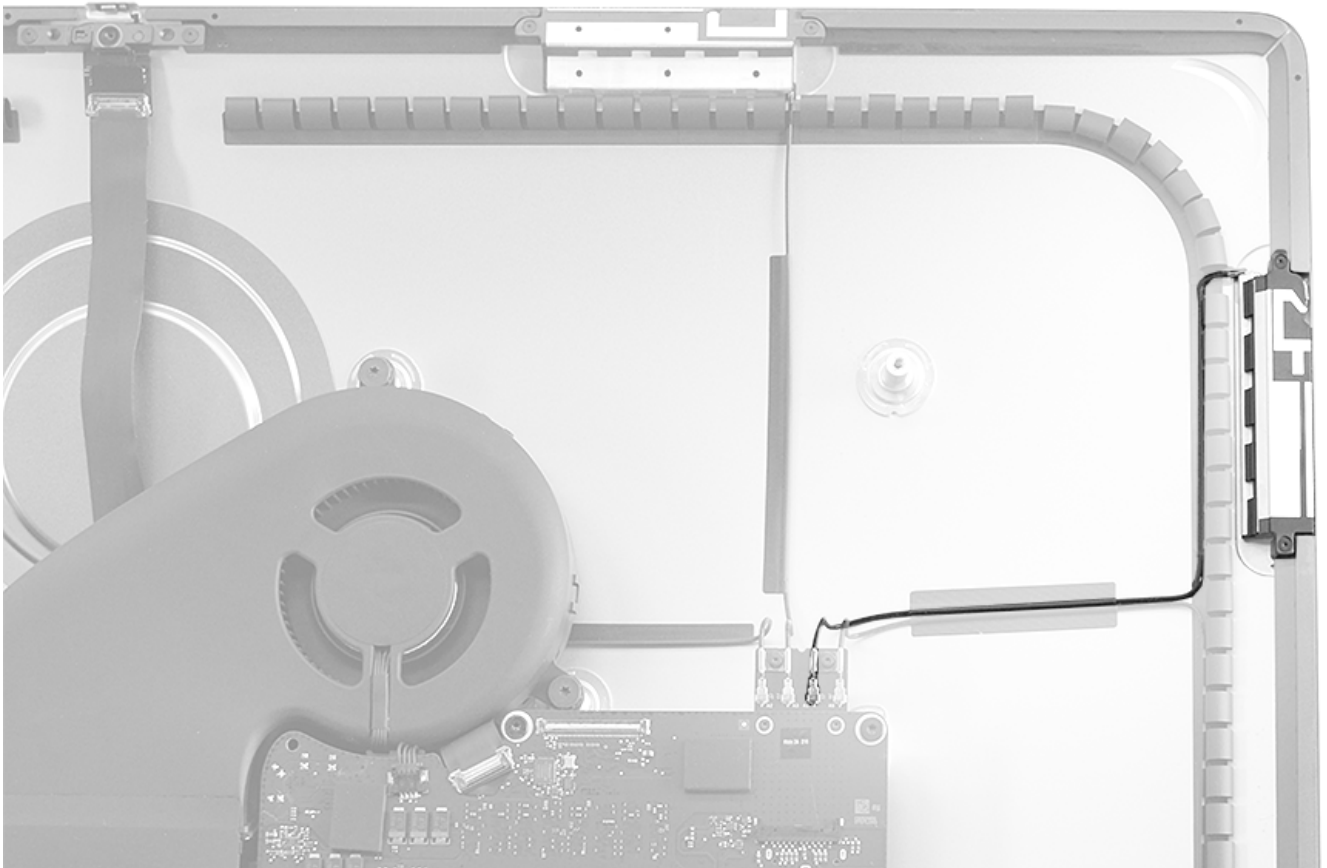
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV294: Bluetooth and Wi-Fi Antenna Replacement Video](#).

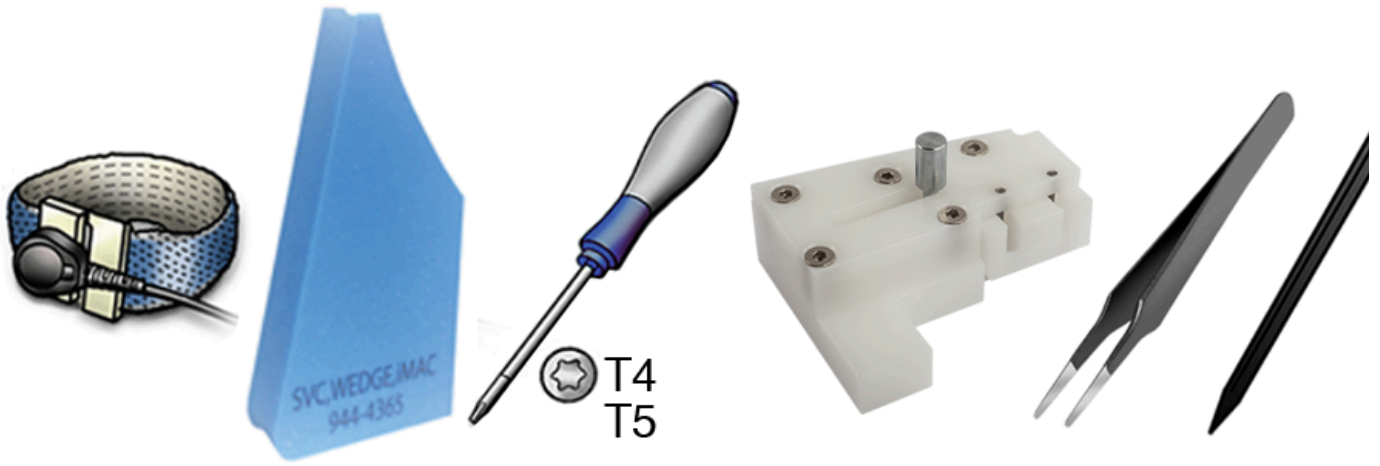
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

- ESD wrist strap and mat
- Service wedge (iMac)
- Torx T4 screwdriver (magnetized)
- Torx T5 screwdriver (magnetized)
- Wireless card support tool (923-00775)
- ESD-safe tweezers
- Black stick

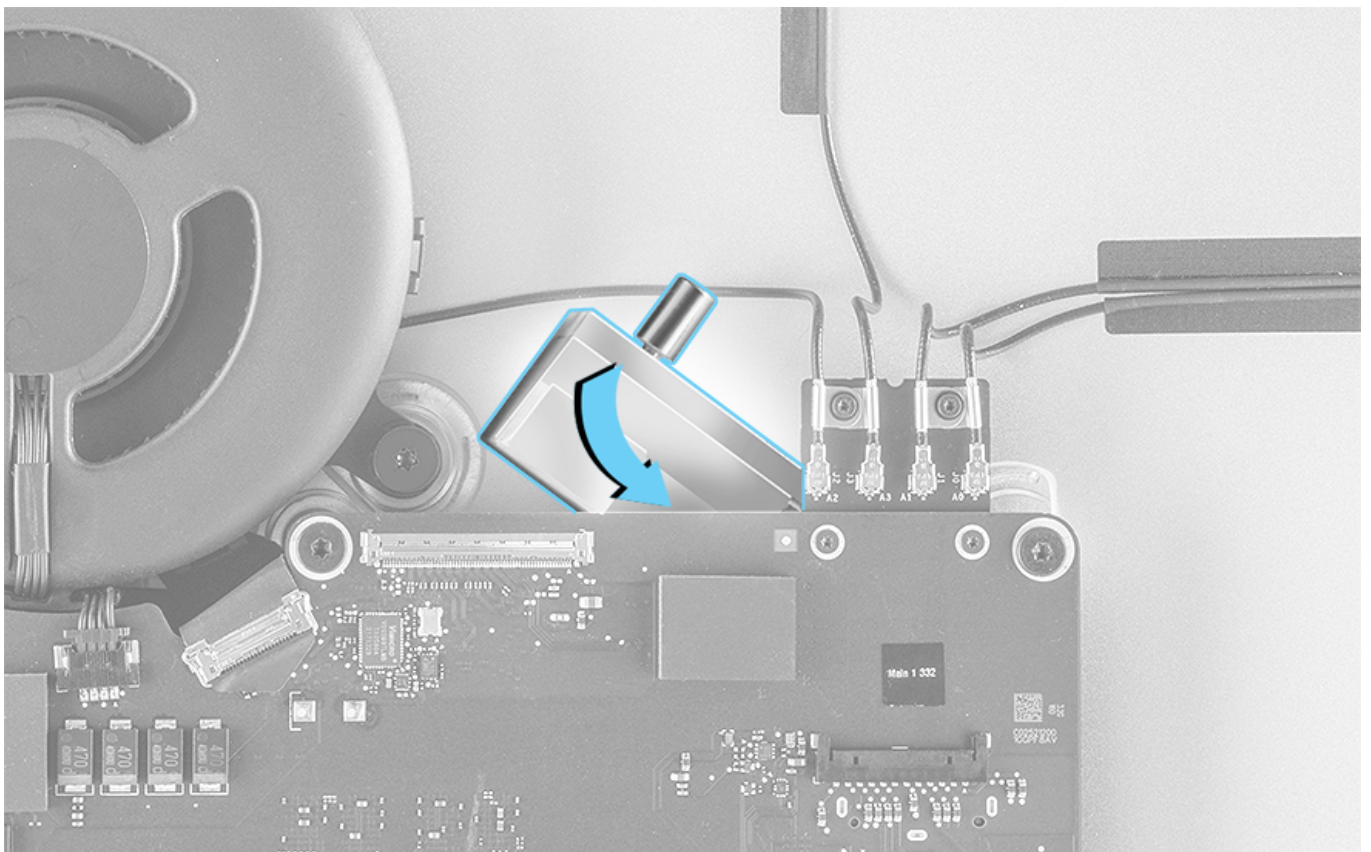


Steps For Removal

Note: The iMac has four Wi-Fi/Bluetooth antennas, three of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be replaced by replacing the rear housing.

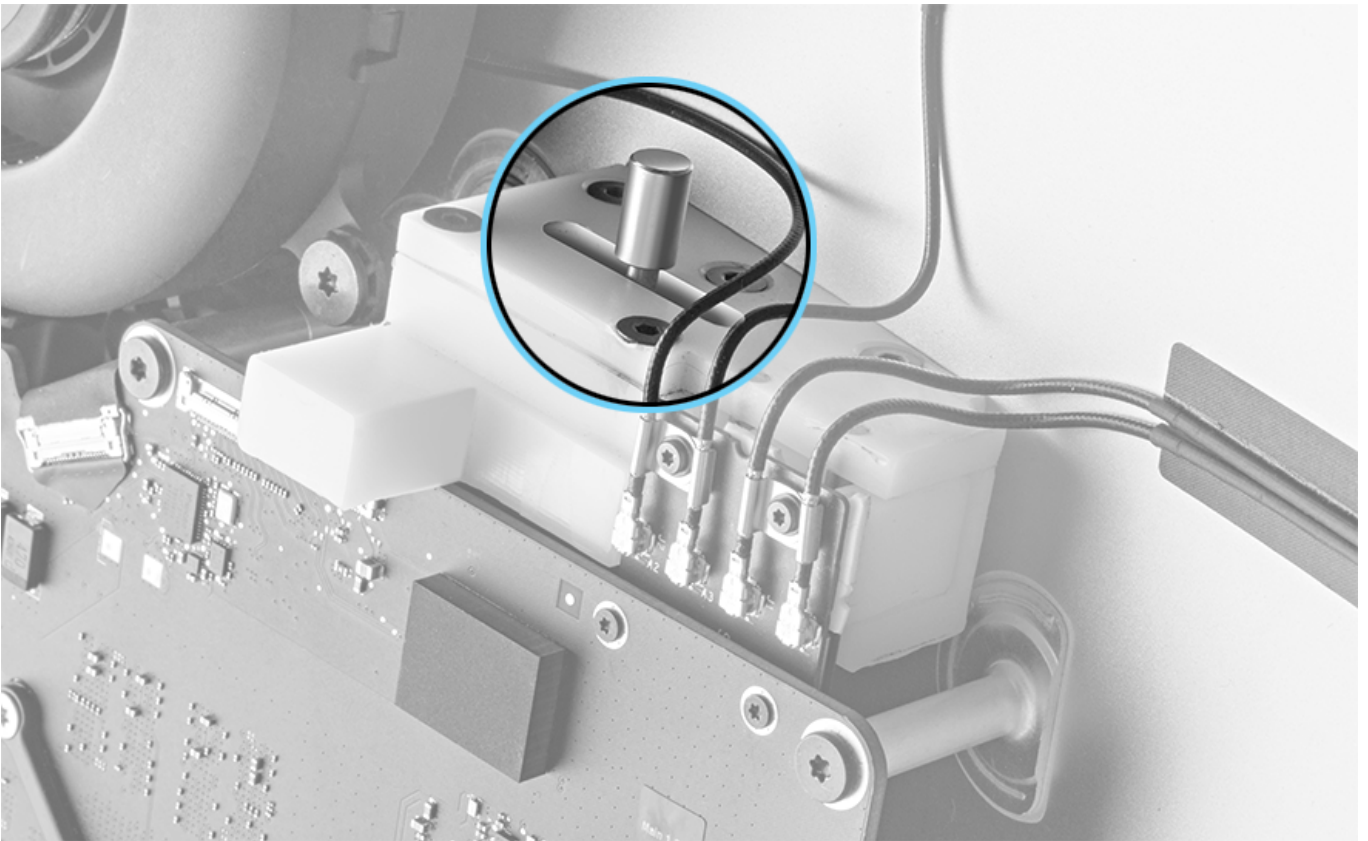
Note: The lever on top of the wireless card support tool controls the movement of the block within. Keep the lever to the left when inserting or removing the tool.

1. To protect the wireless card, slide the wireless card support tool into place between the rear housing and the wireless card.

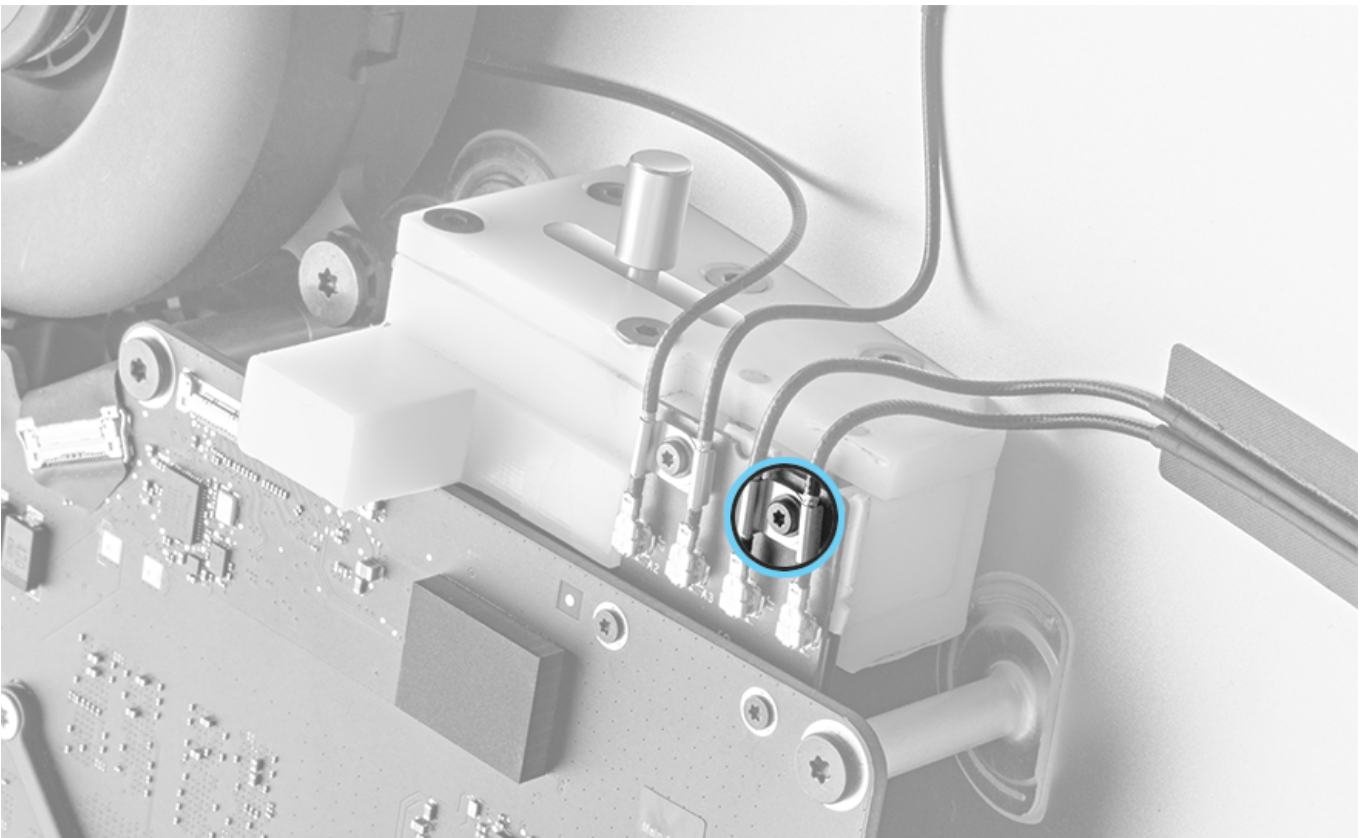


2. Move the lever to the right until the inner block presses against the wireless card.

When positioned correctly, the support tool is held firmly in place and cannot be shifted. Keep the support tool in position while removing or replacing screws and disconnecting or reconnecting antenna cables.

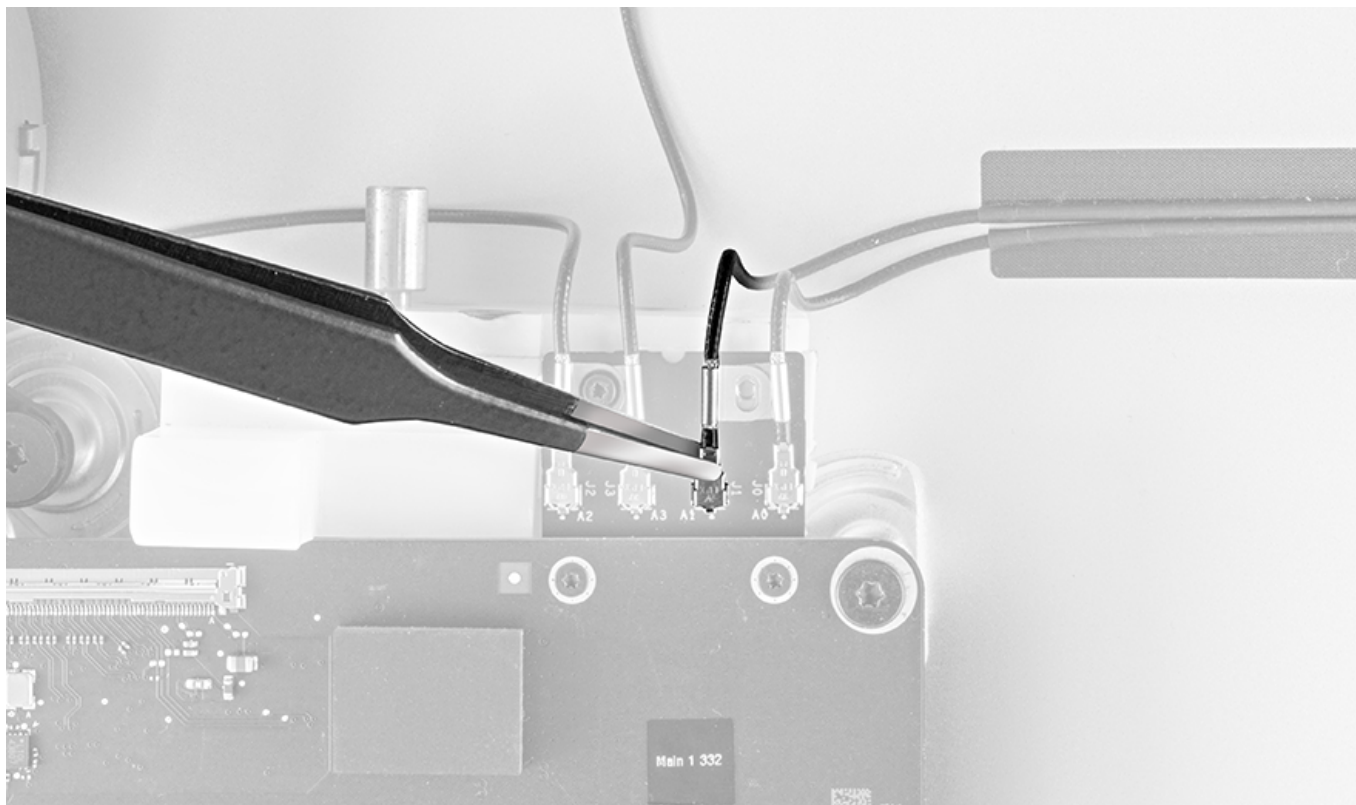


3. Remove the 3.8 mm T5 (923-00609) screw and washer from the wireless card.

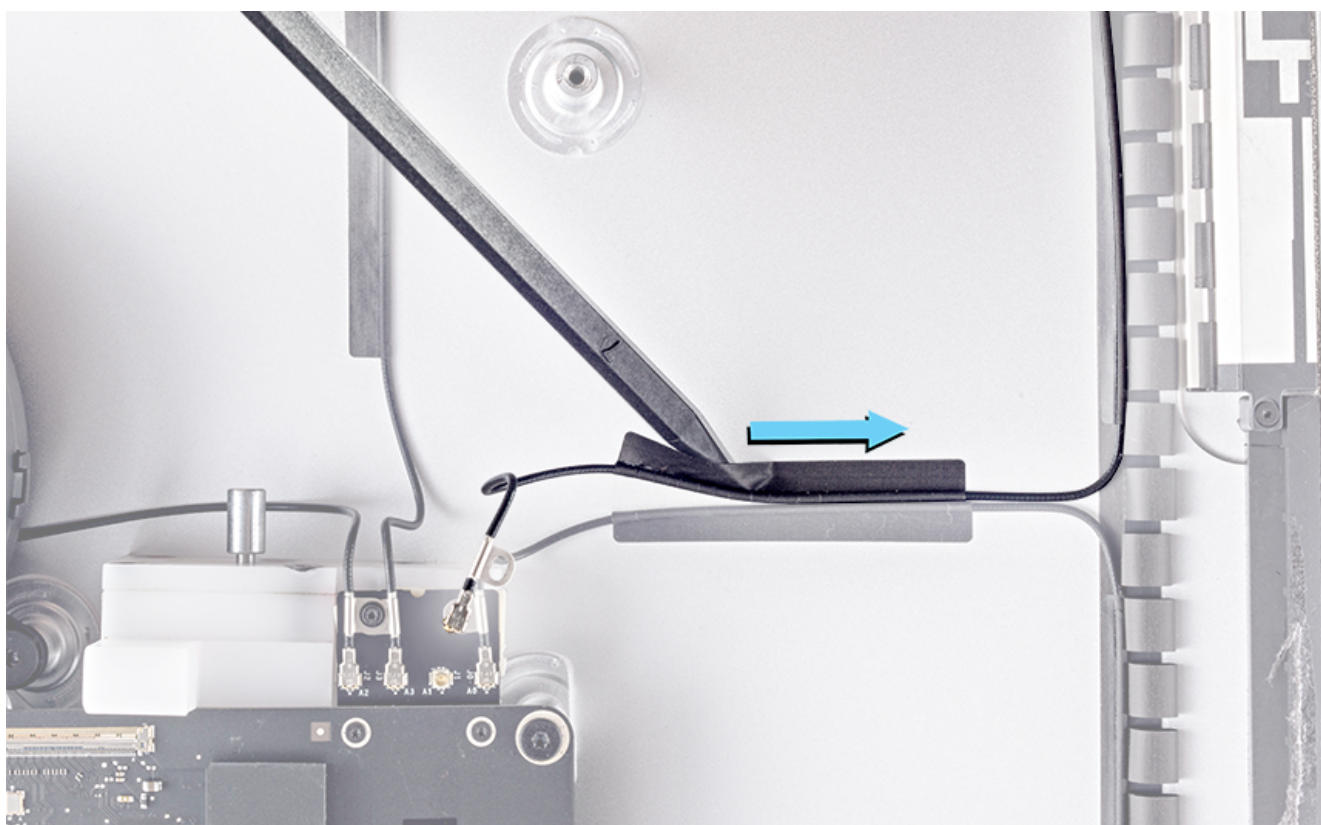


4. Use ESD-safe tweezers to disconnect the connector from the wireless card.

Note: Avoid using a metal tool that could crimp or damage the cable.



5. Use a black stick to gently unroute the cable and its tape from the rear housing.

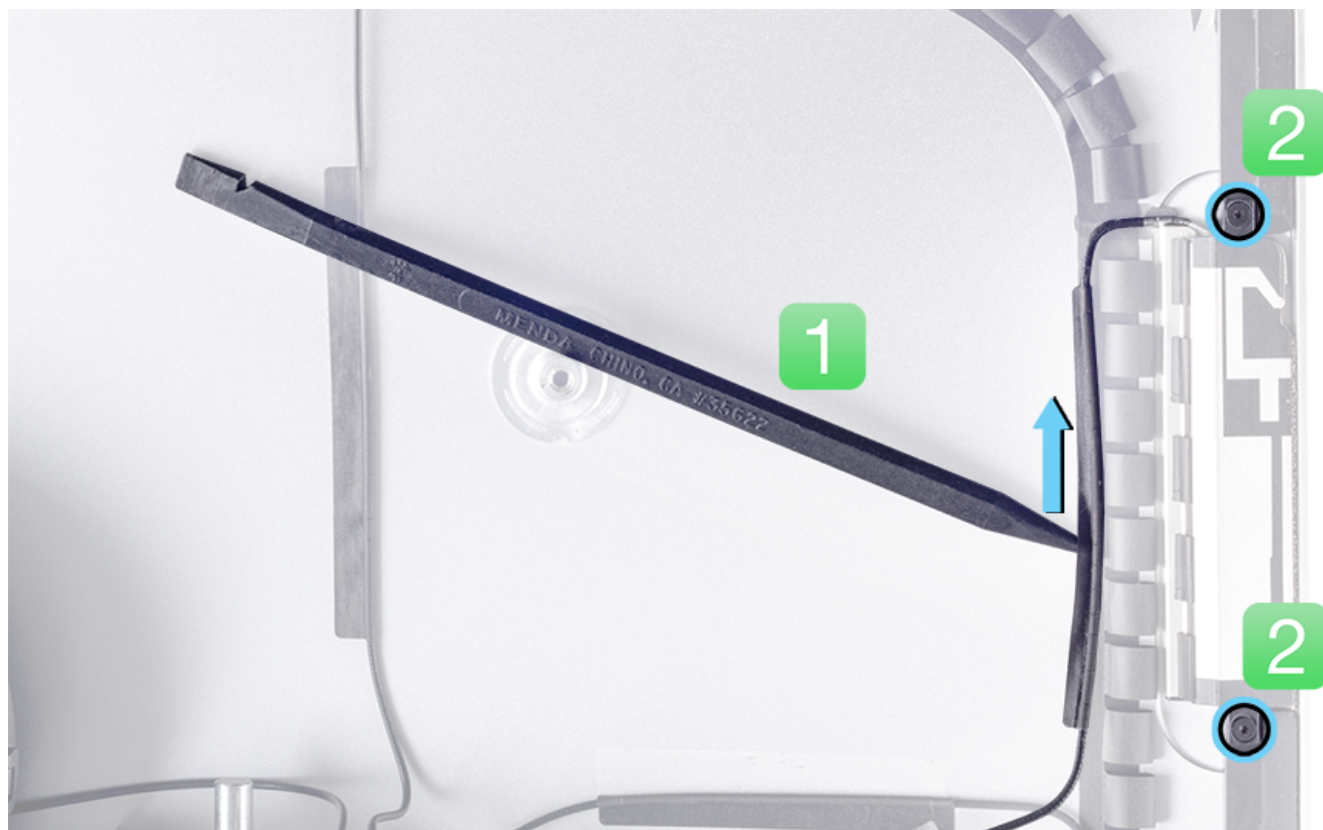


6. Use a black stick to gently loosen the tape along the airloop gasket (#1).

7. Remove two T4 (923-0304) screws that secure the antenna body to the rear housing (#2).



8. Remove the mid Wi-Fi antenna from the computer assembly.

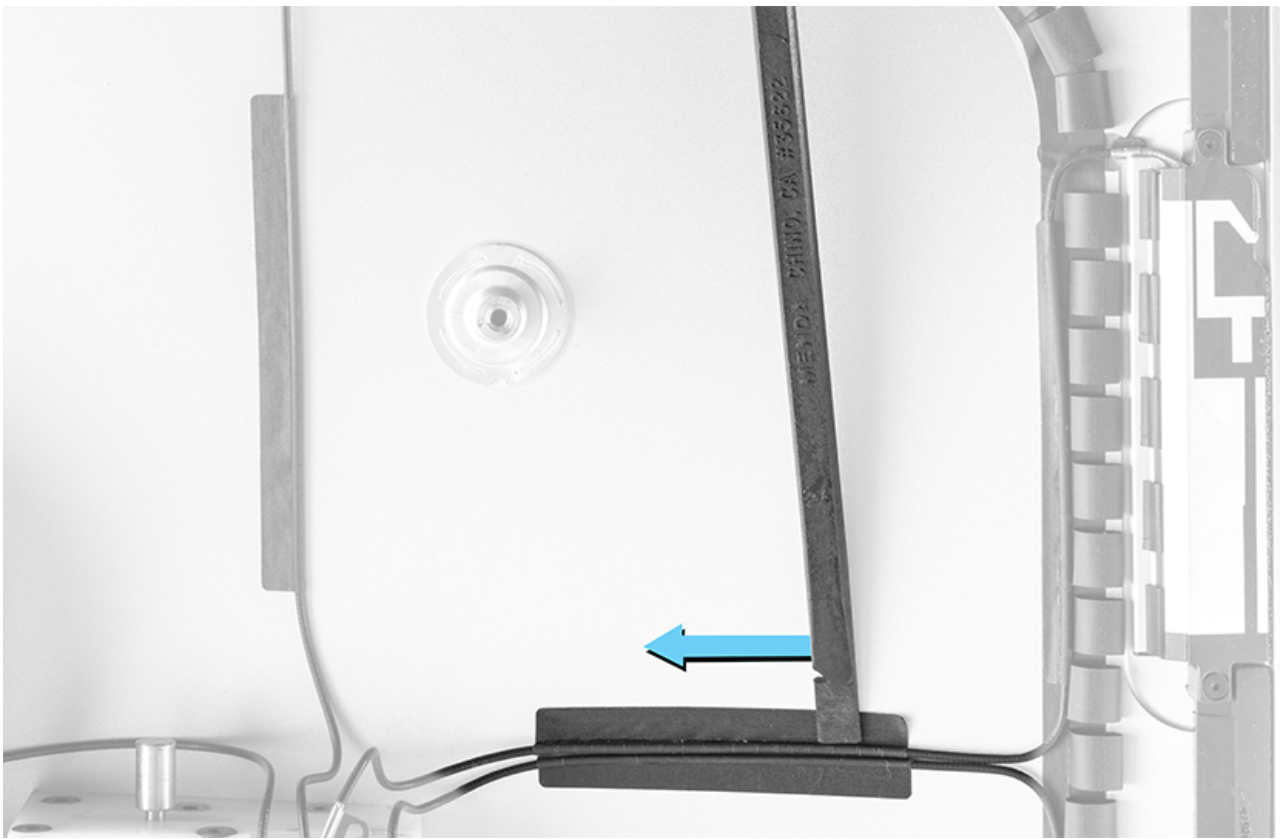


Steps For Reassembly

1. Install two T4 screws (923-0304) to secure the antenna body to the rear housing.

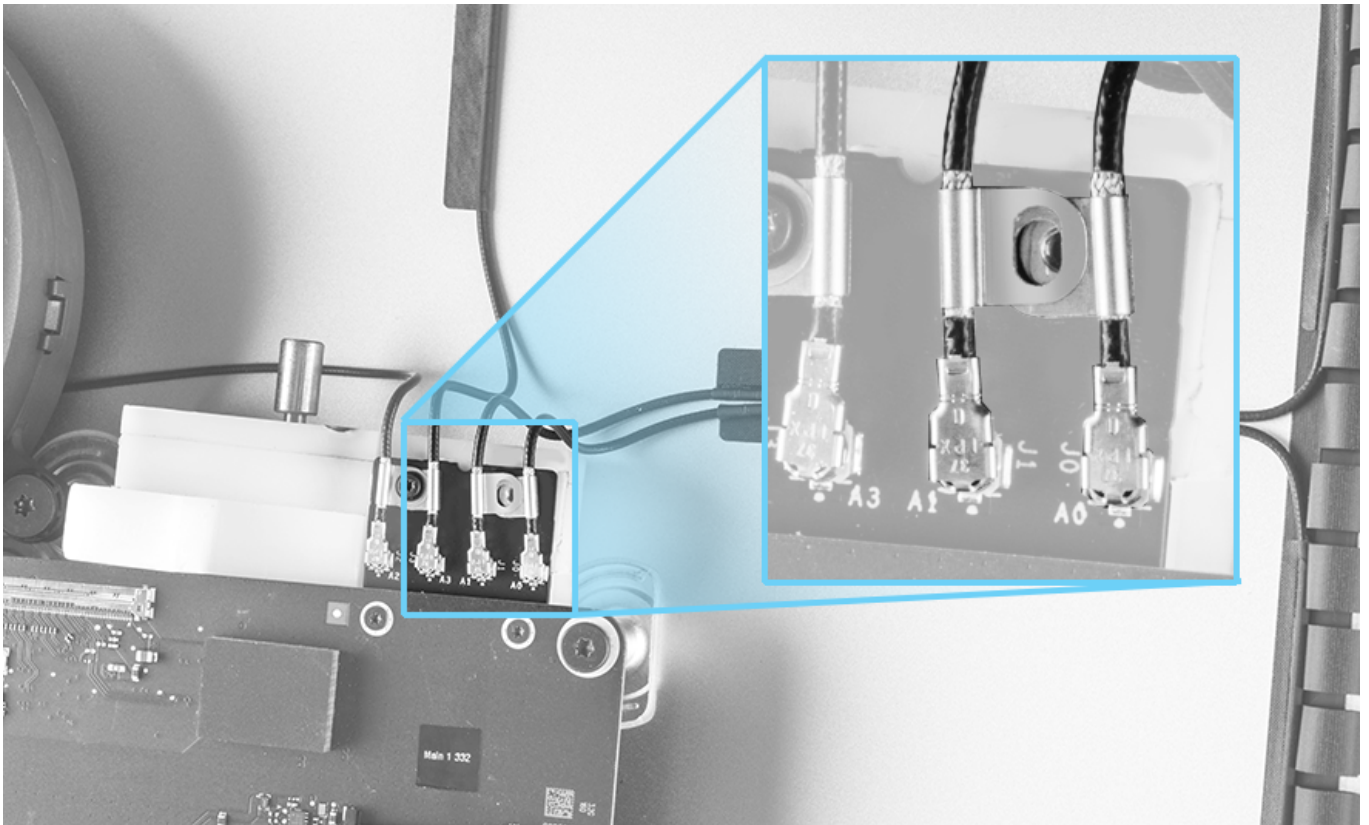


2. Route the antenna cable to the housing. Use the flat end of a black stick to secure the tape.

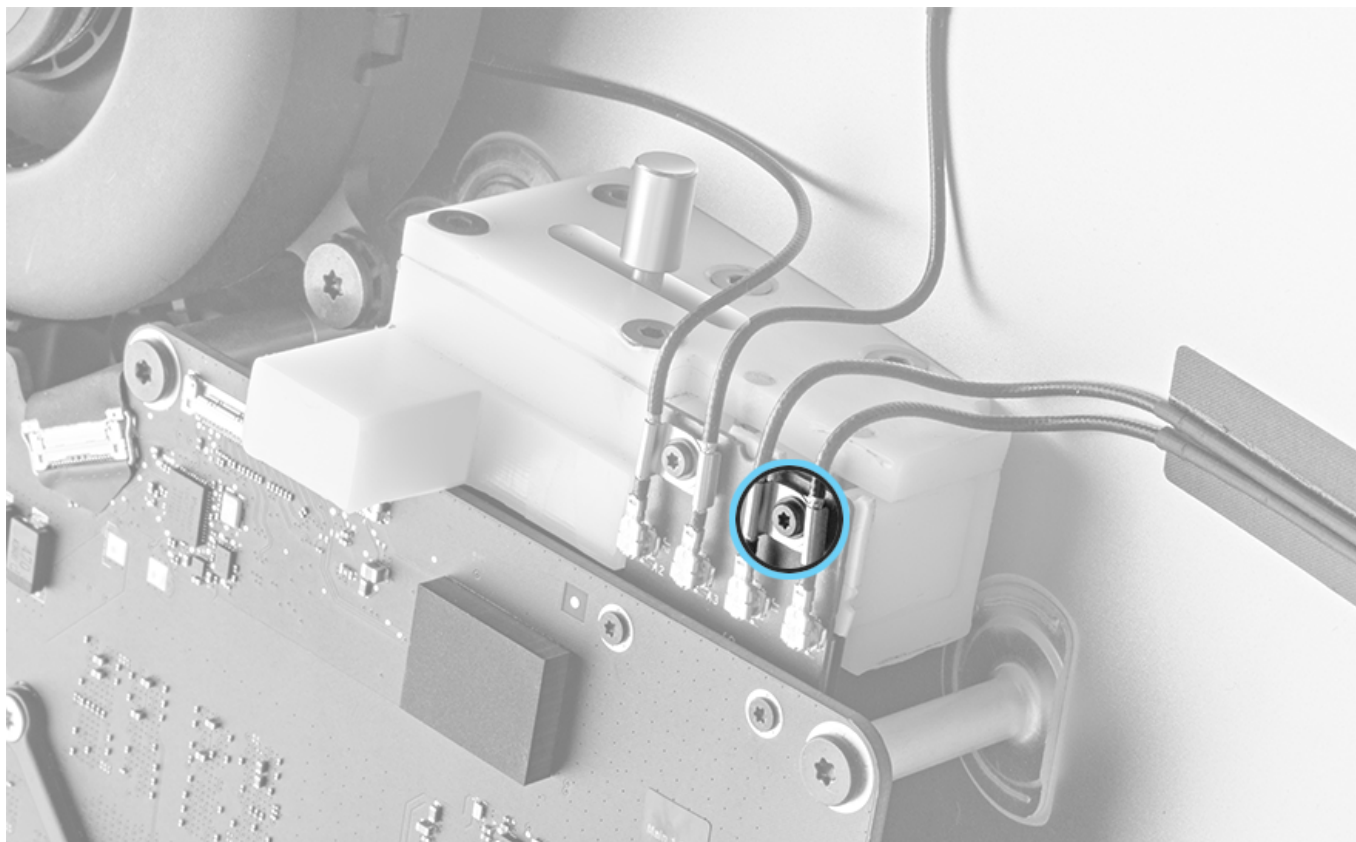


3. Slide the right bracket under the left bracket.

4. Use ESD-safe tweezers to connect the cable to the wireless card.

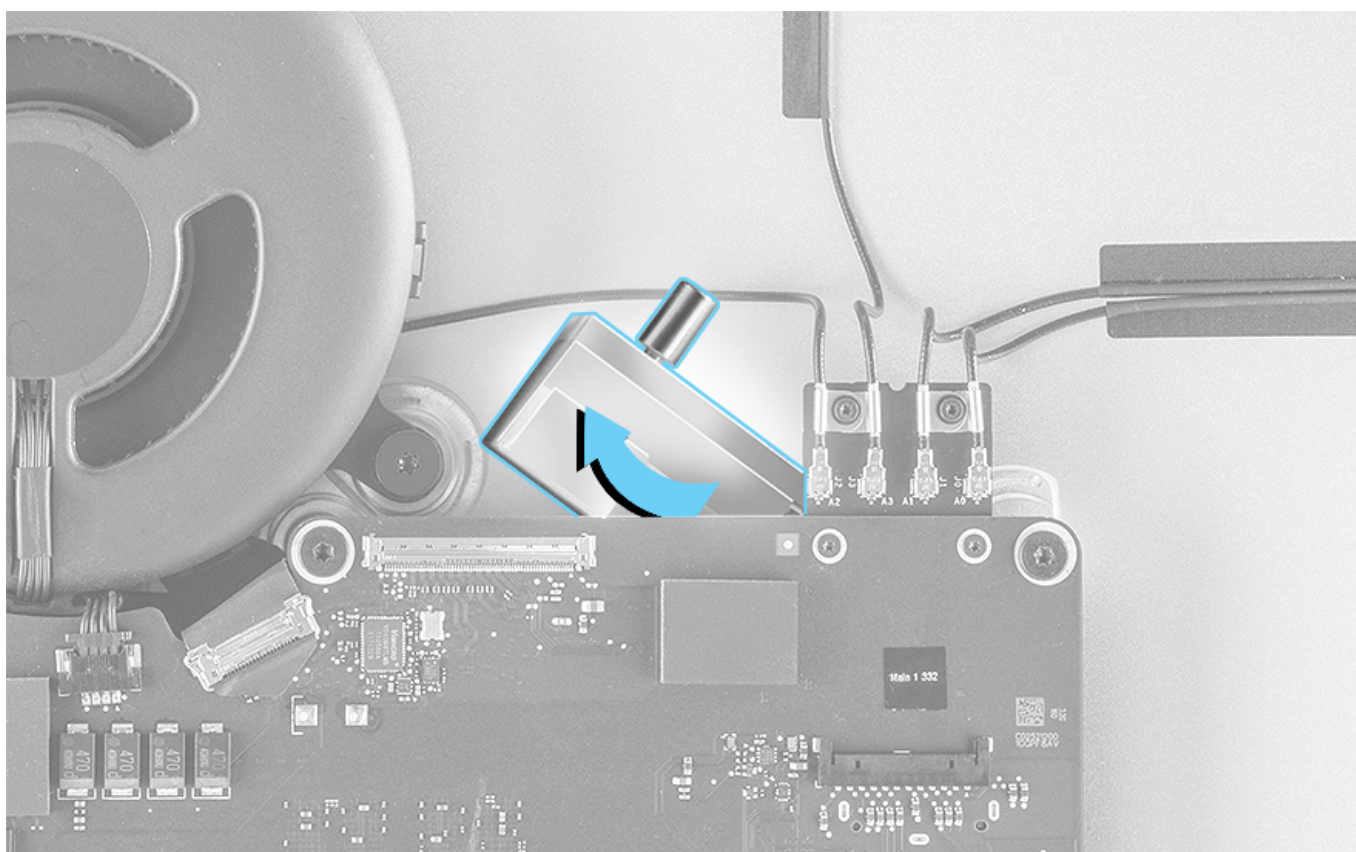


5. Install the 3.8 mm T5 (923-00609) screw and the washer to the wireless card.

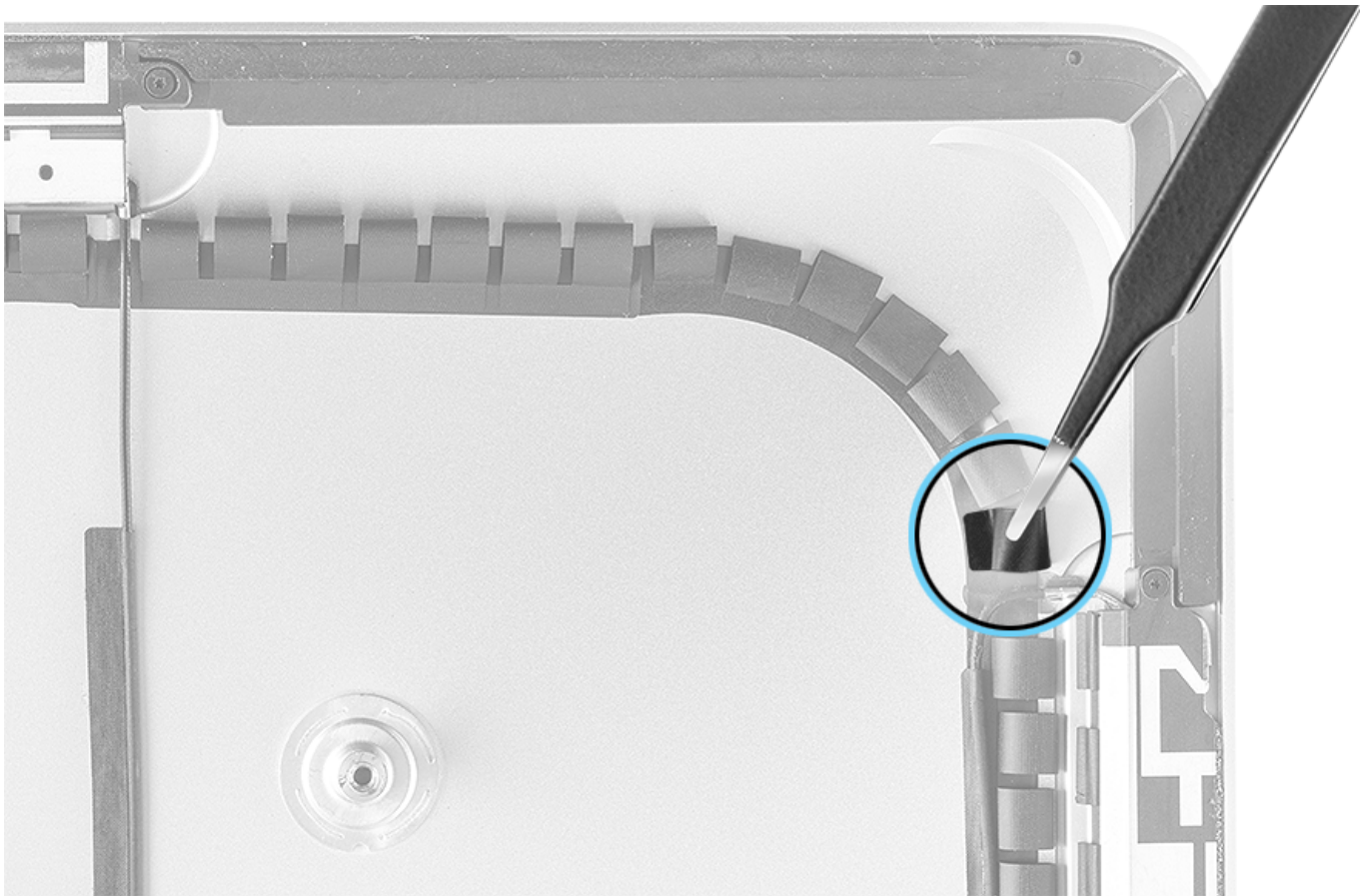


6. Move the lever on the support tool to the left.

7. Remove the support tool from the rear housing.



8. Check the airloop gasket and use a black stick or tweezers to open any flattened loops.



9. Reinstall the [right speaker](#).

10. Reinstall the [chin strap](#).

11. Install new [display panel VHB strips](#).

12. Reinstall the [display panel](#).

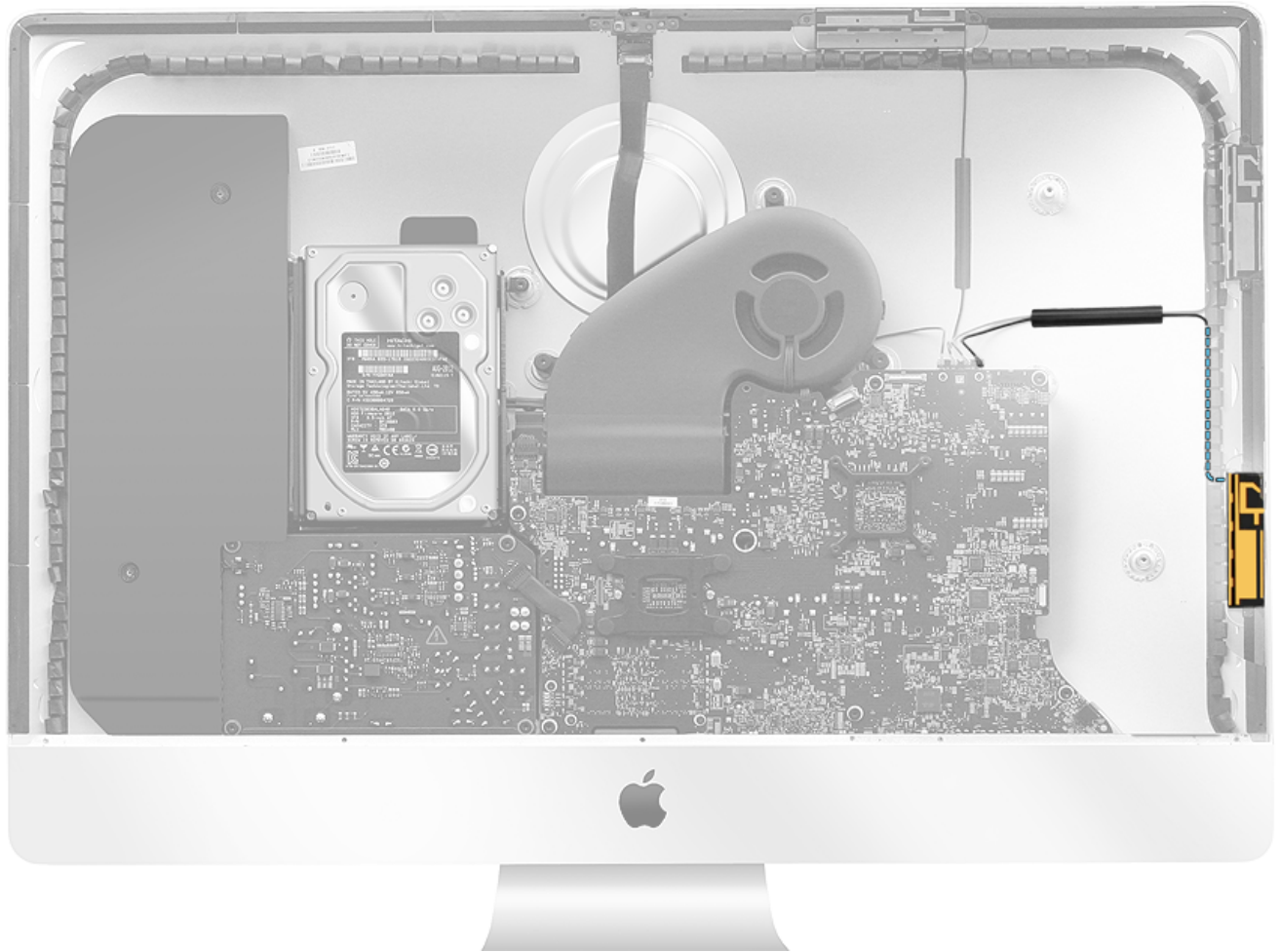
Wi-Fi Antenna, Lower

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

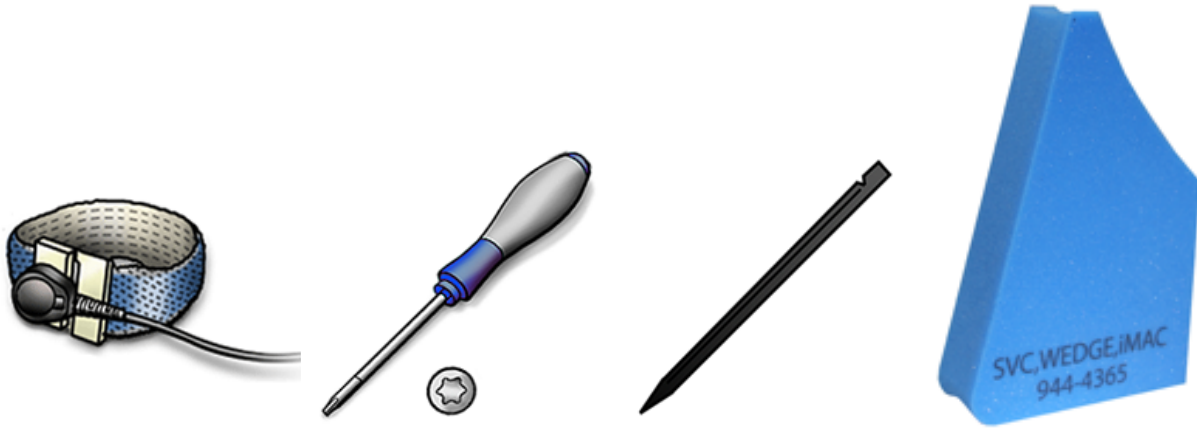
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

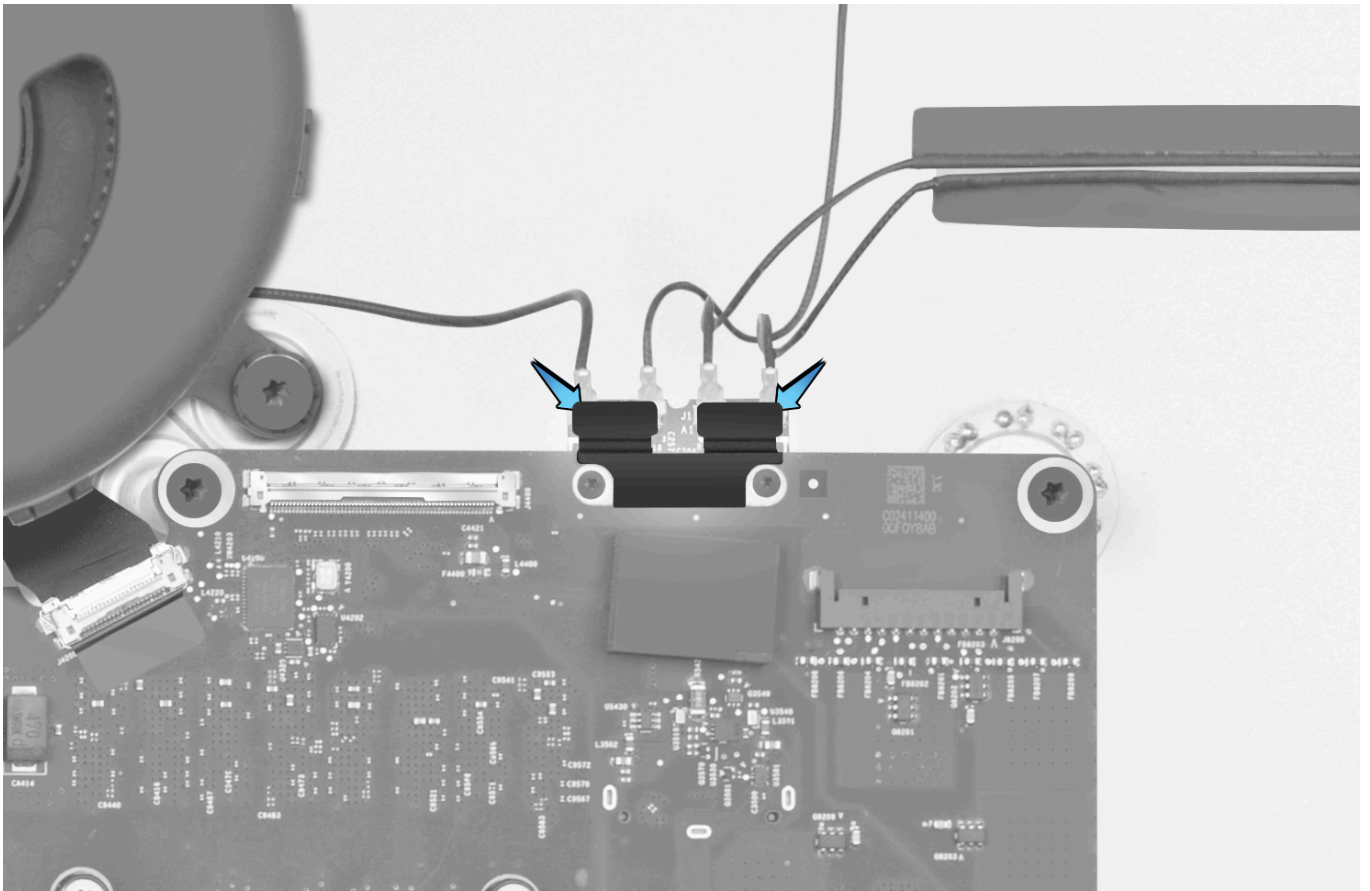
- ESD wrist strap and mat
- Torx T4 screwdriver (magnetized)
- Black stick
- Service wedge (iMac)



Steps For Removal

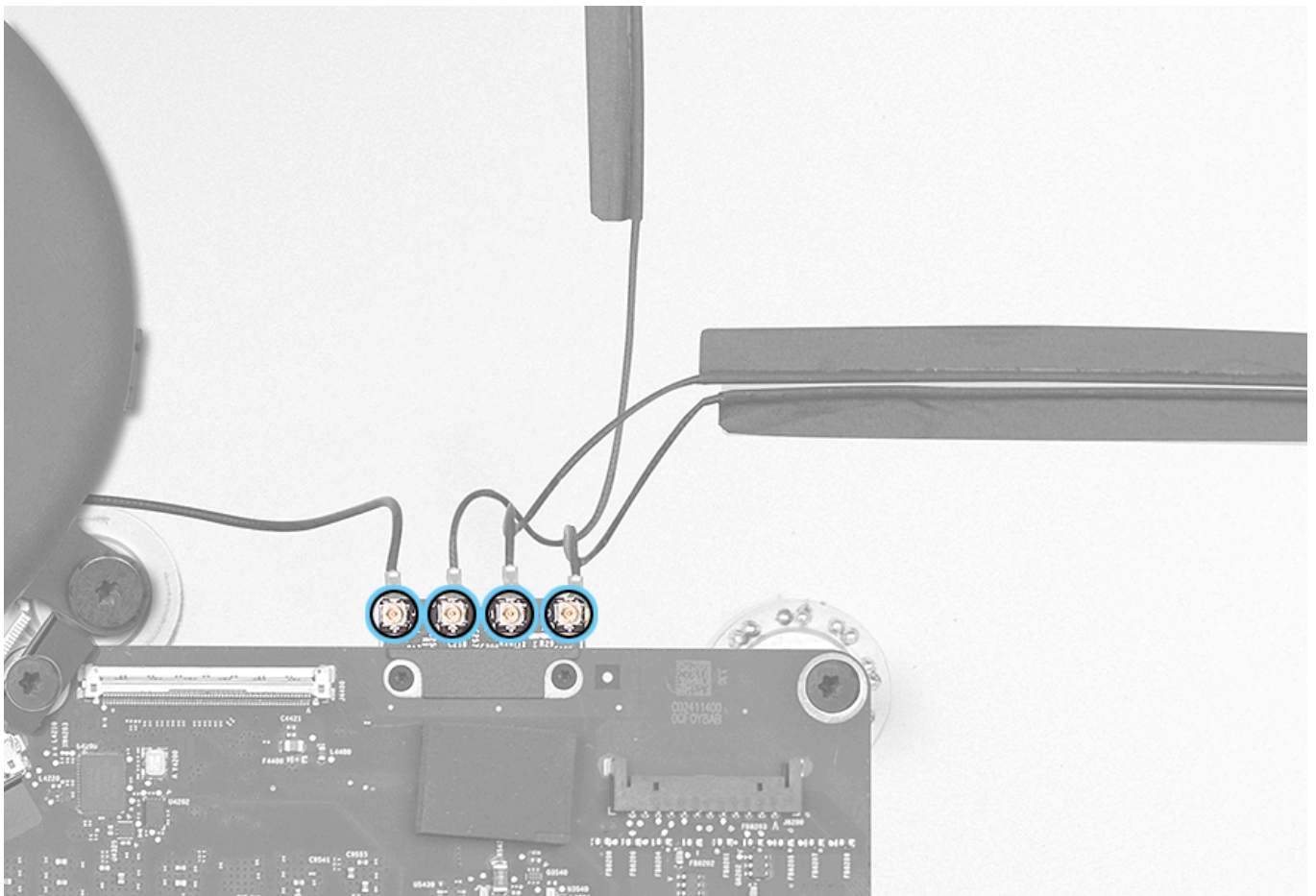
Note: The iMac has four Wi-Fi/Bluetooth antennas, three of which are removable. The fourth resides inside the Apple logo on the rear housing and can only be replaced by replacing the rear housing.

1. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick to peel down the tape that covers the antenna cable connectors.

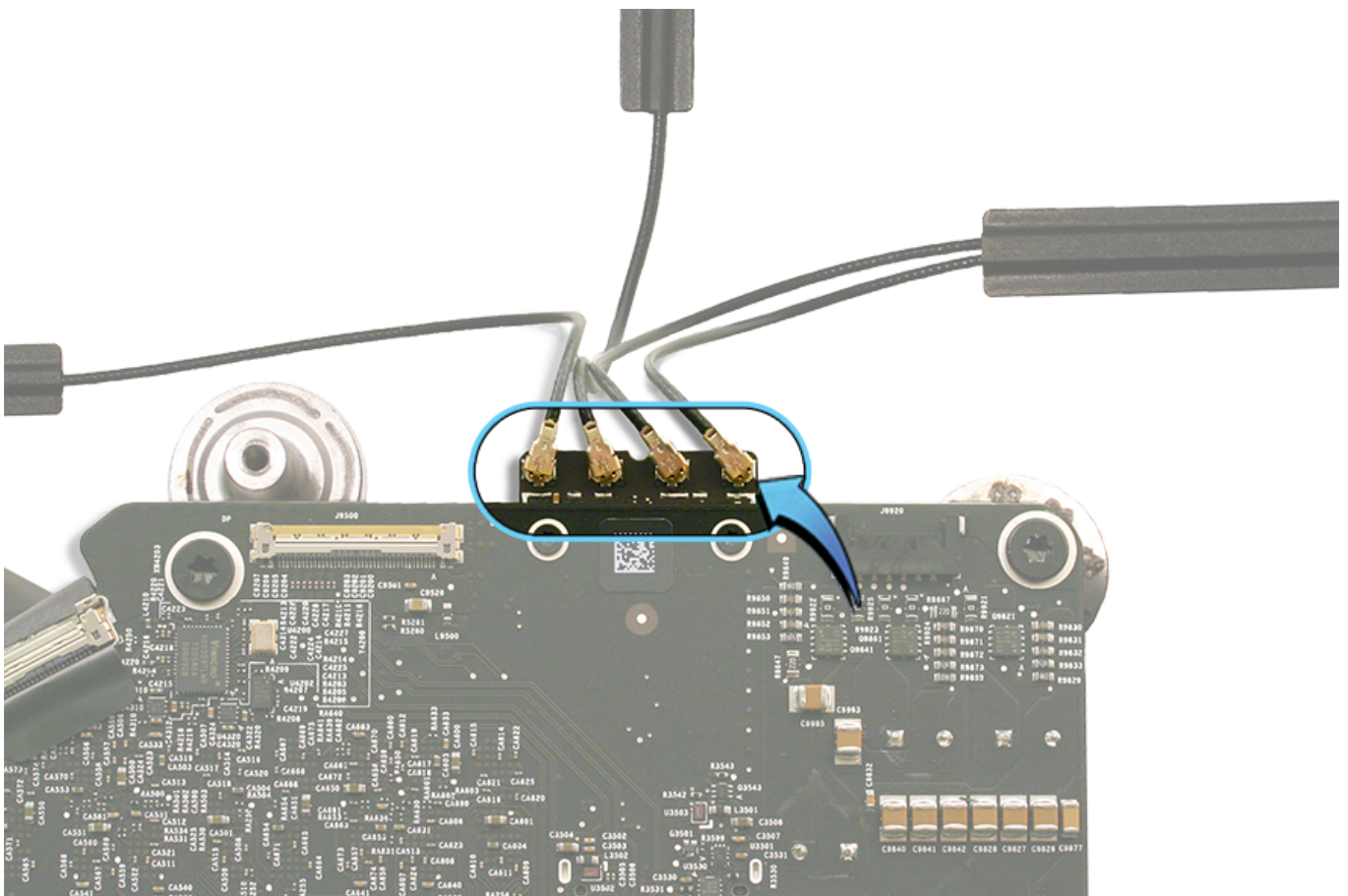


2. On the wireless card, disconnect the antenna on the far right.

iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)

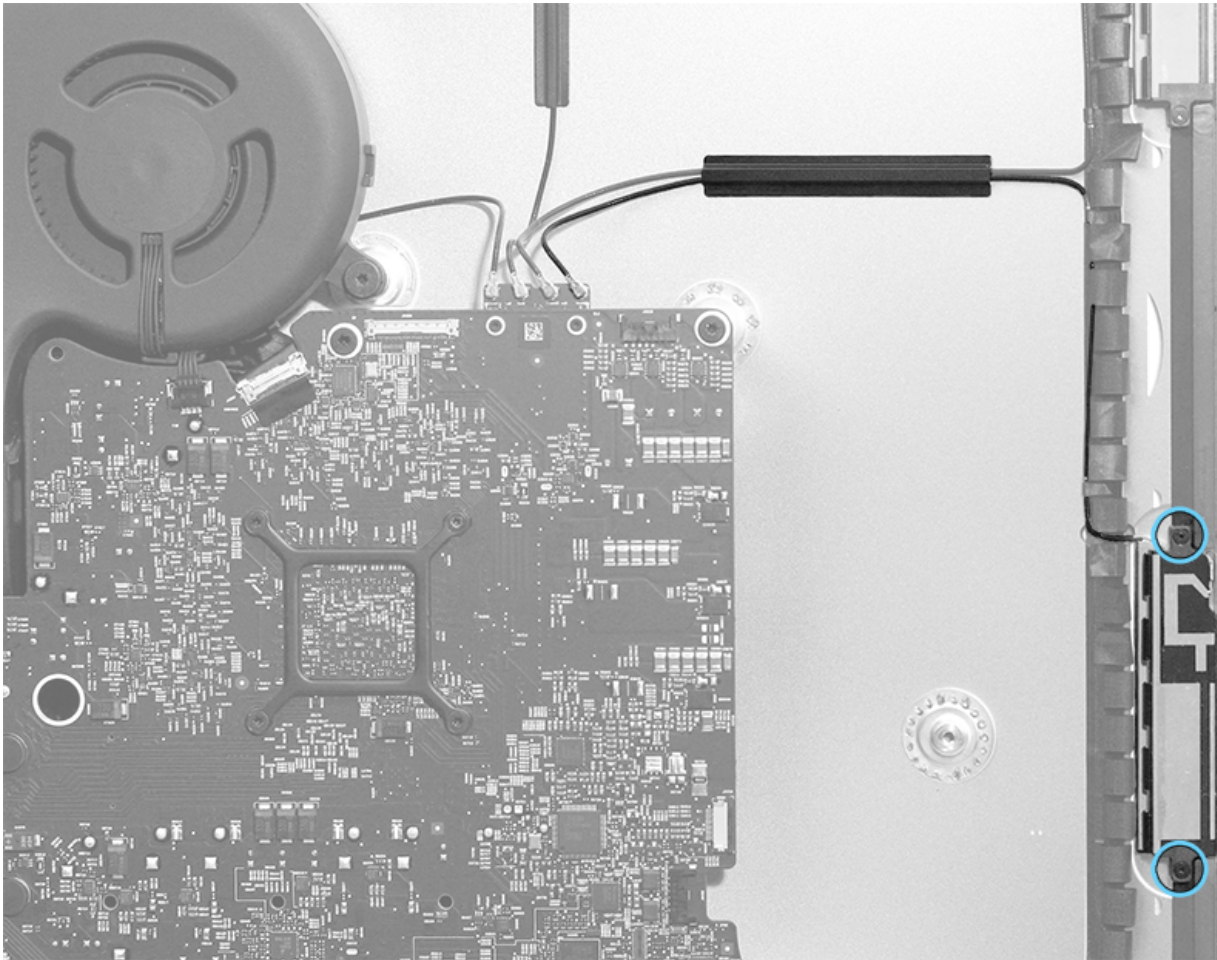


iMac (27-inch, Late 2012 and Late 2013)



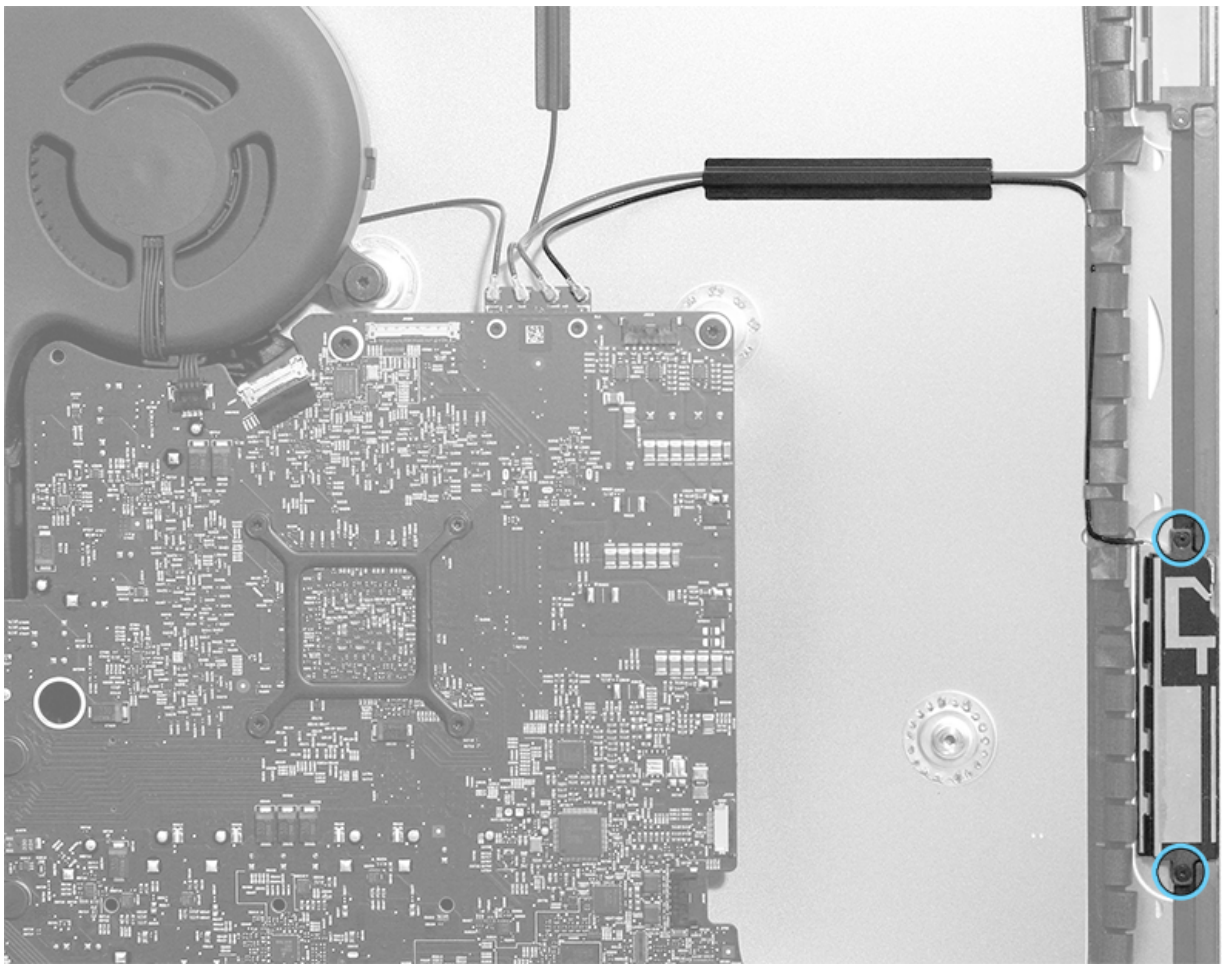
3. Remove two T4 antenna screws.

- 923-0304



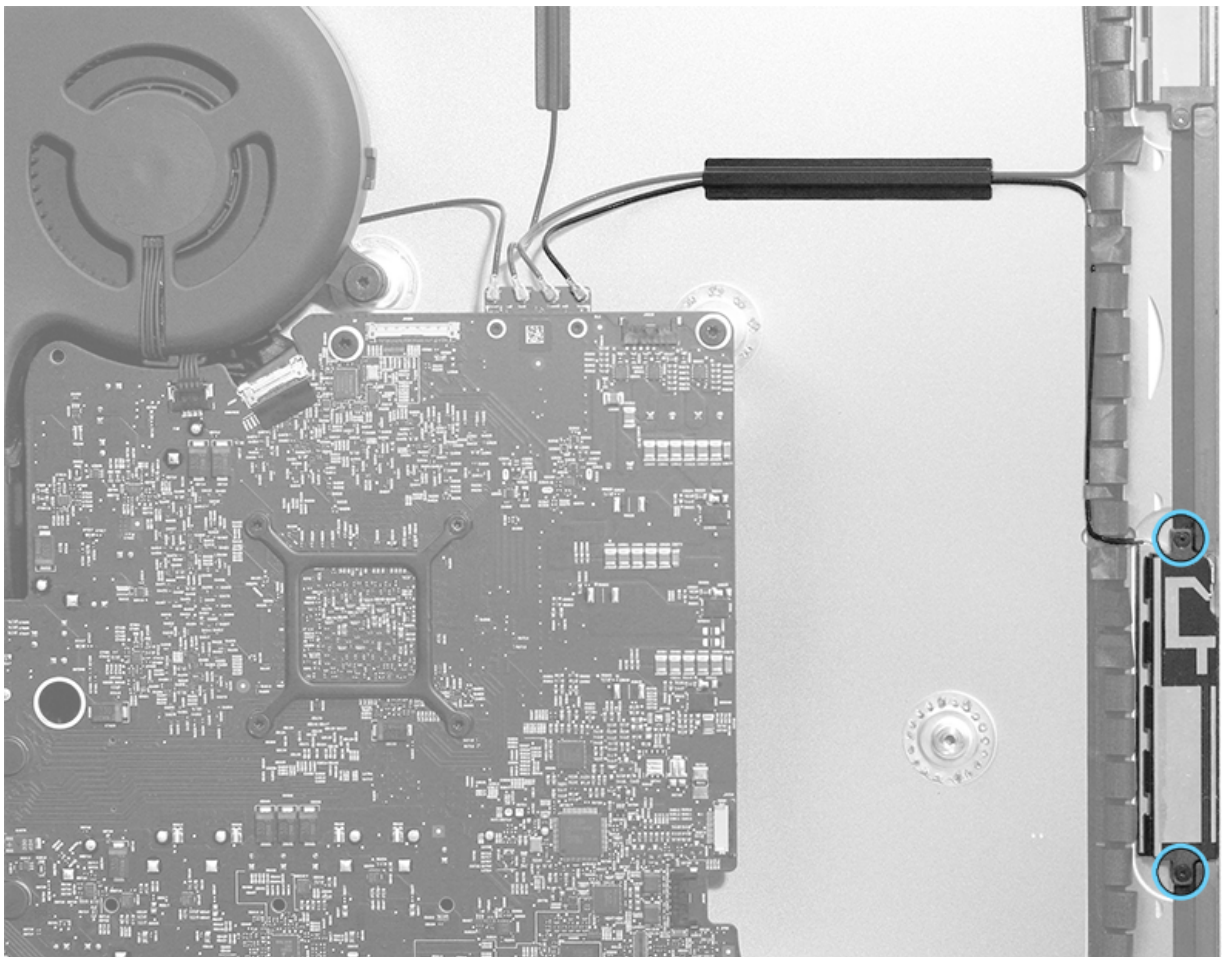
4. With a black stick:

- Peel up the tiny piece of Mylar tape that secures the antenna cable (located within the airloop gasket running alongside the antenna) to the rear housing.
- Pry up the insulator strip (iMac, Late 2012) or the black tape (iMac, Late 2013 or later) to free the antenna cable from the rear housing.



Steps For Reassembly

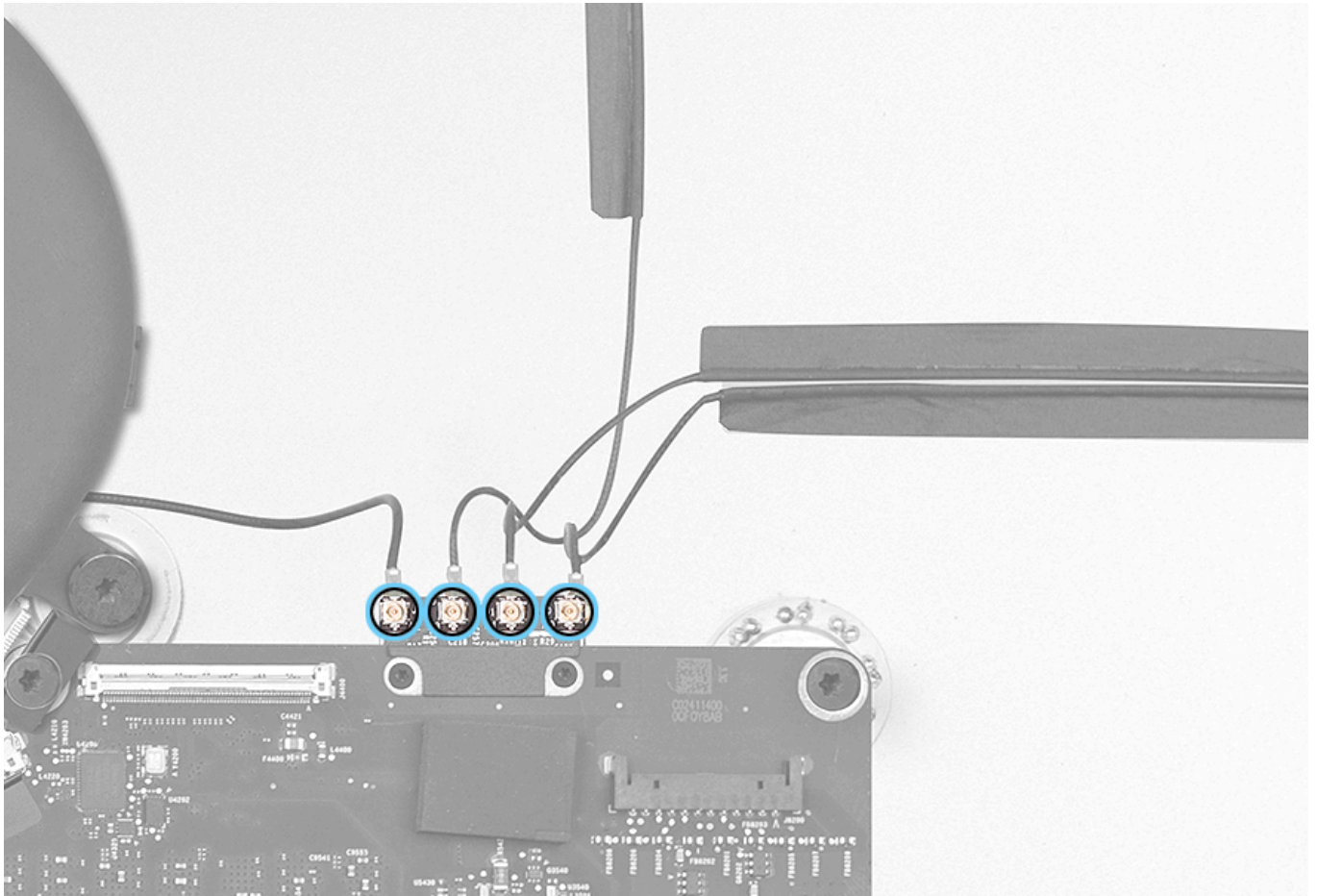
1. Install two antenna screws to the Wi-Fi antenna.



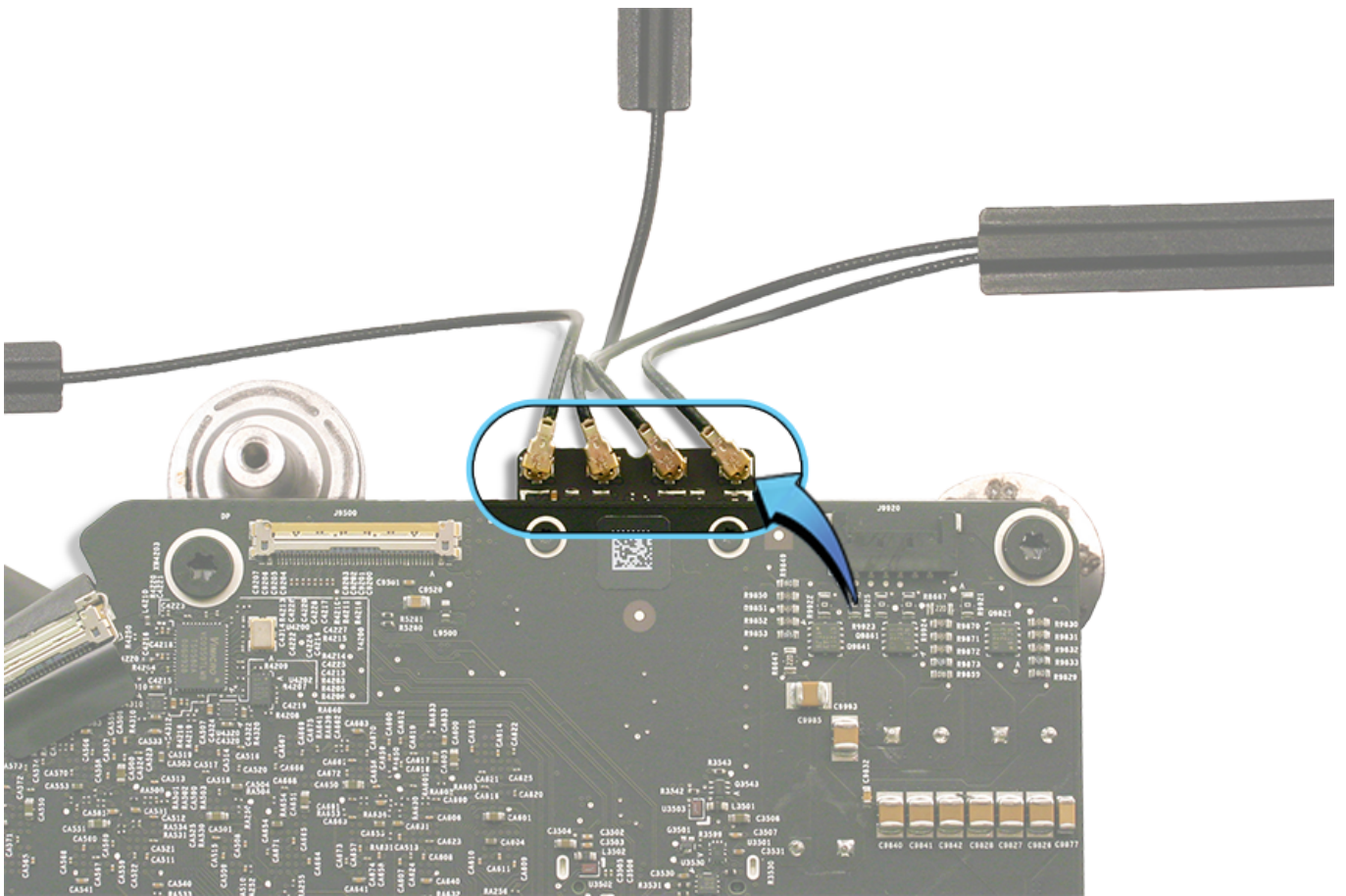
2. Connect the lower antenna to the connector on the far right on the wireless card.

Note: If installing a replacement antenna, peel the backing off of the Mylar tape and stick the antenna to the rear housing.

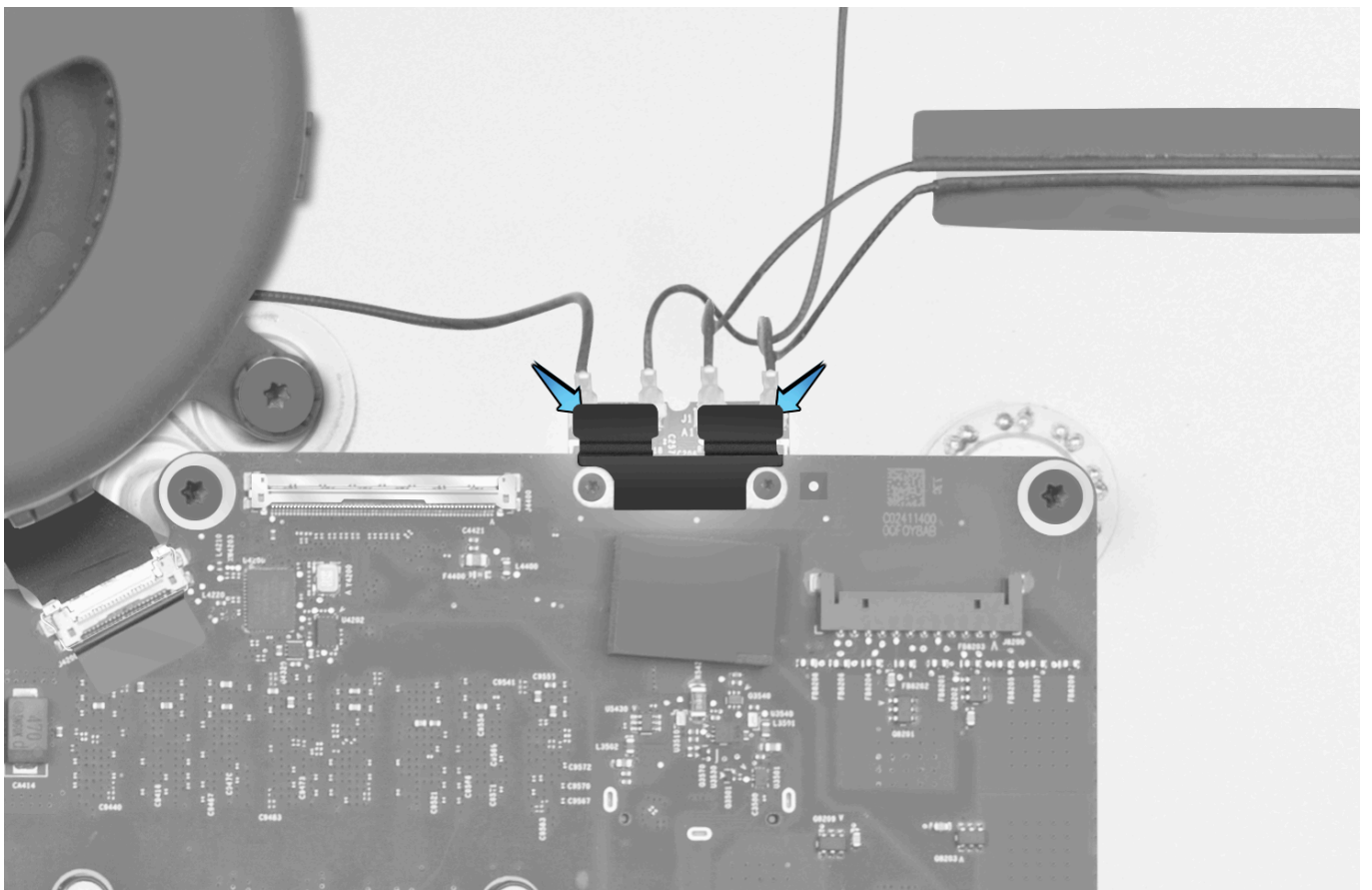
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)



3. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), use a black stick or your finger to secure the Mylar tape onto the antenna cable connectors.



Lower Wi-Fi Antenna

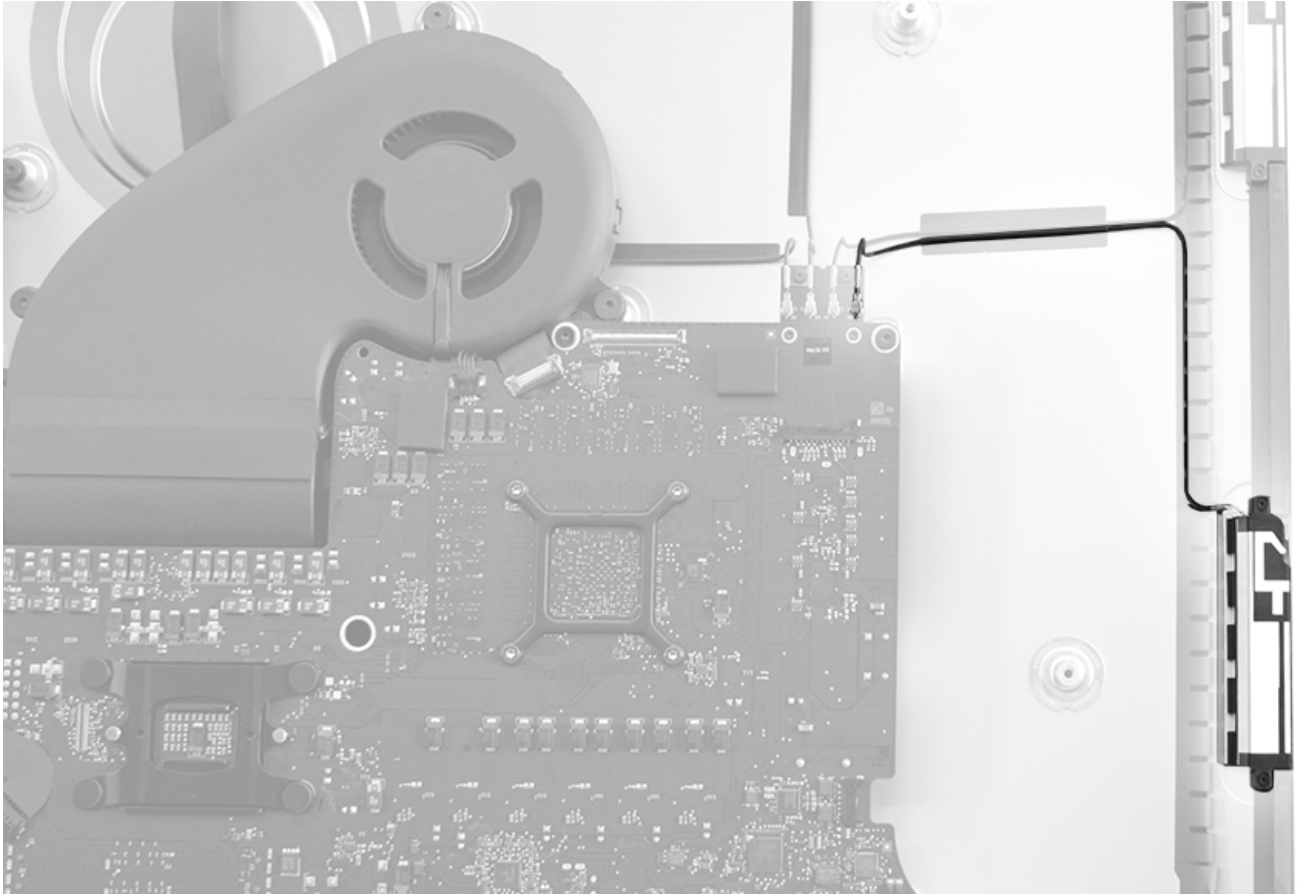
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV294: Bluetooth and Wi-Fi Antenna Replacement Video](#).

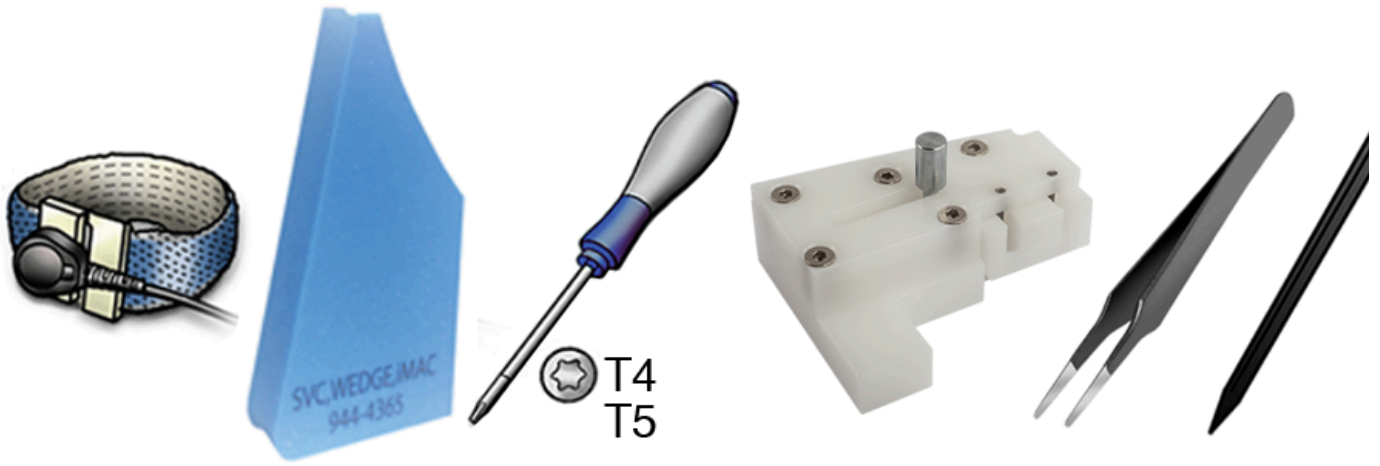
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Right speaker](#)



Tools

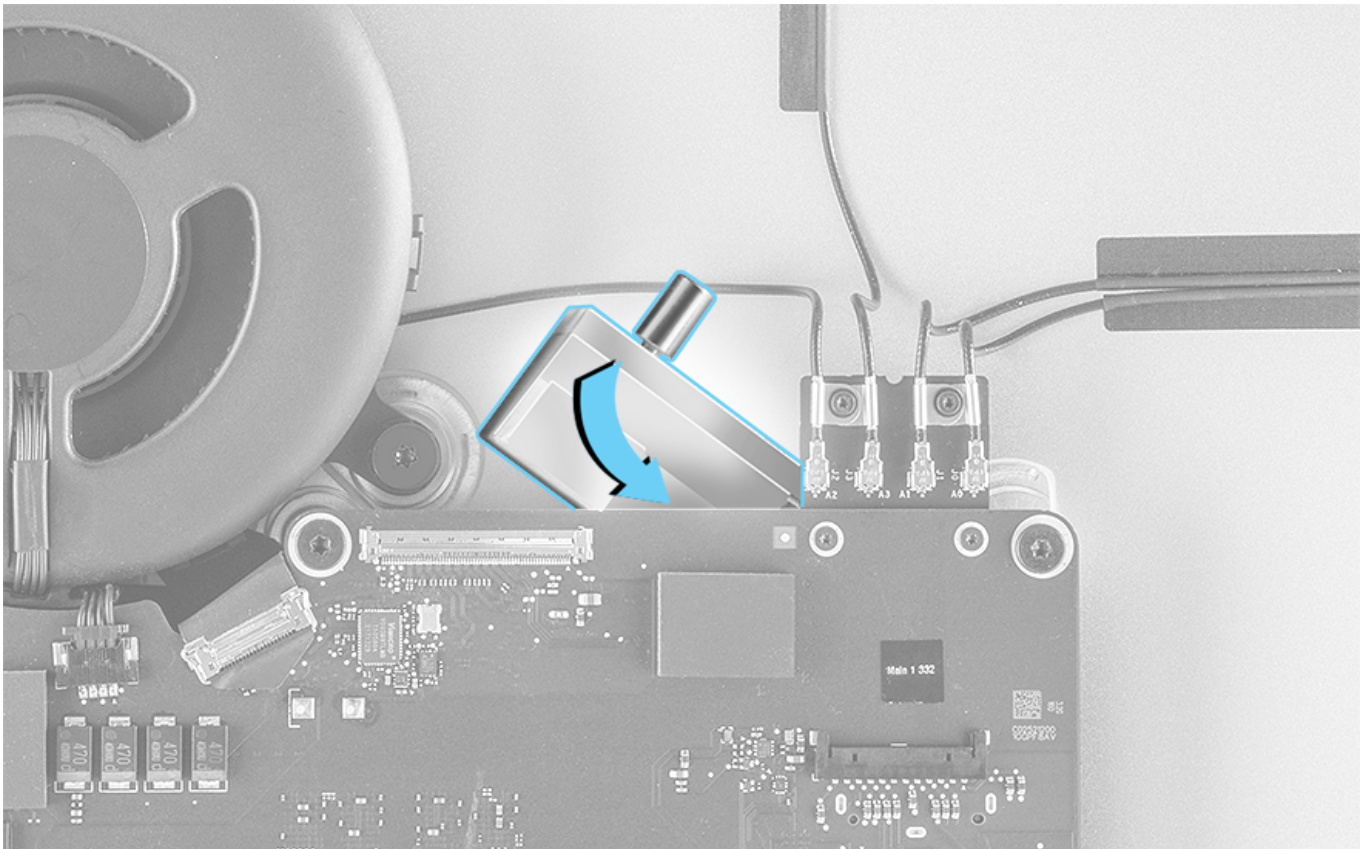
- ESD wrist strap and mat
- Service wedge (iMac)
- Torx T5 screwdriver (magnetized)
- Torx T4 screwdriver (magnetized)
- Wireless card support tool (923-00775)
- ESD-safe tweezers
- Black stick



Steps For Removal

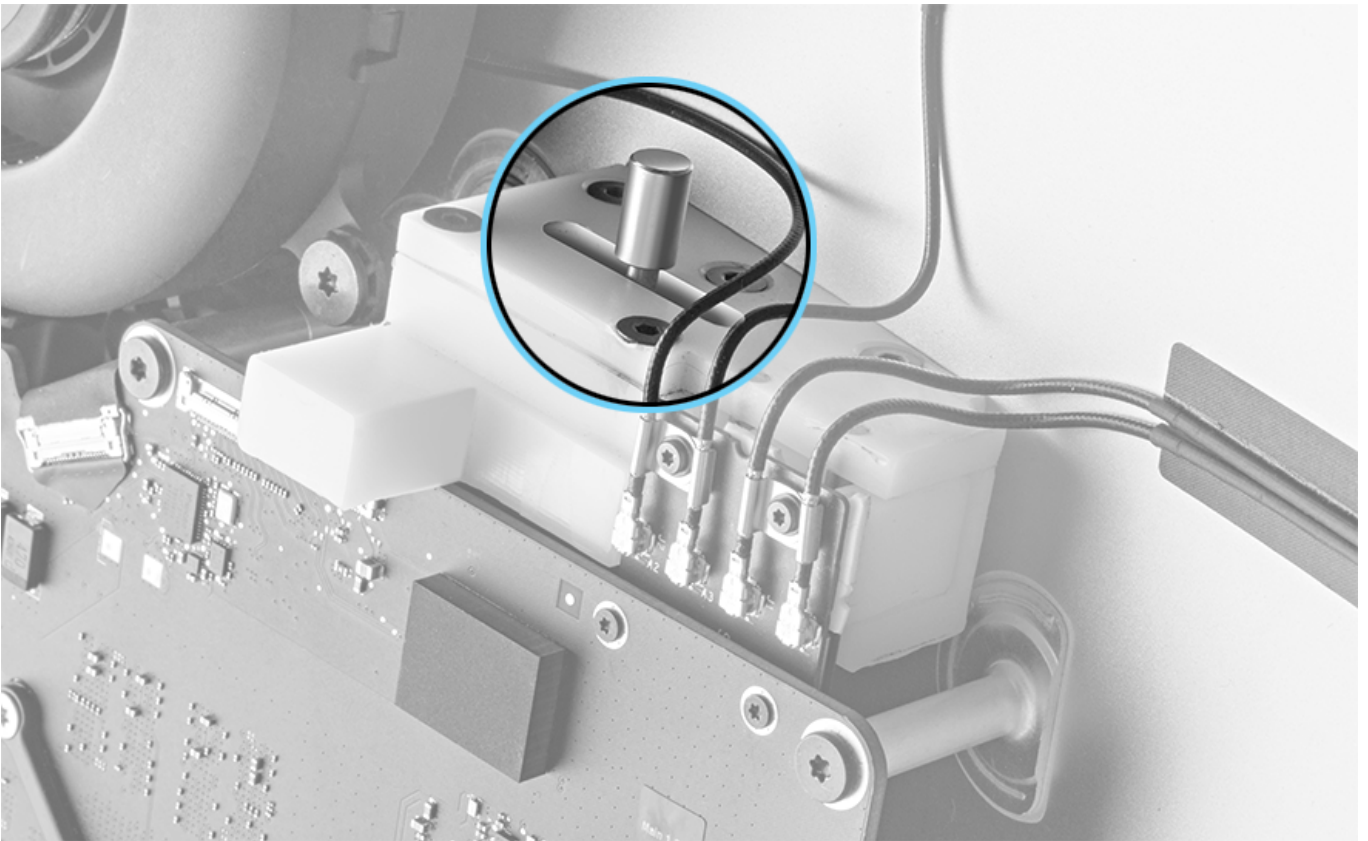
Note: The lever on top of the wireless card support tool controls the movement of the block within. Keep the lever to the left when inserting or removing the tool.

1. To protect the wireless card, slide the wireless card support tool into place between the rear housing and the wireless card.

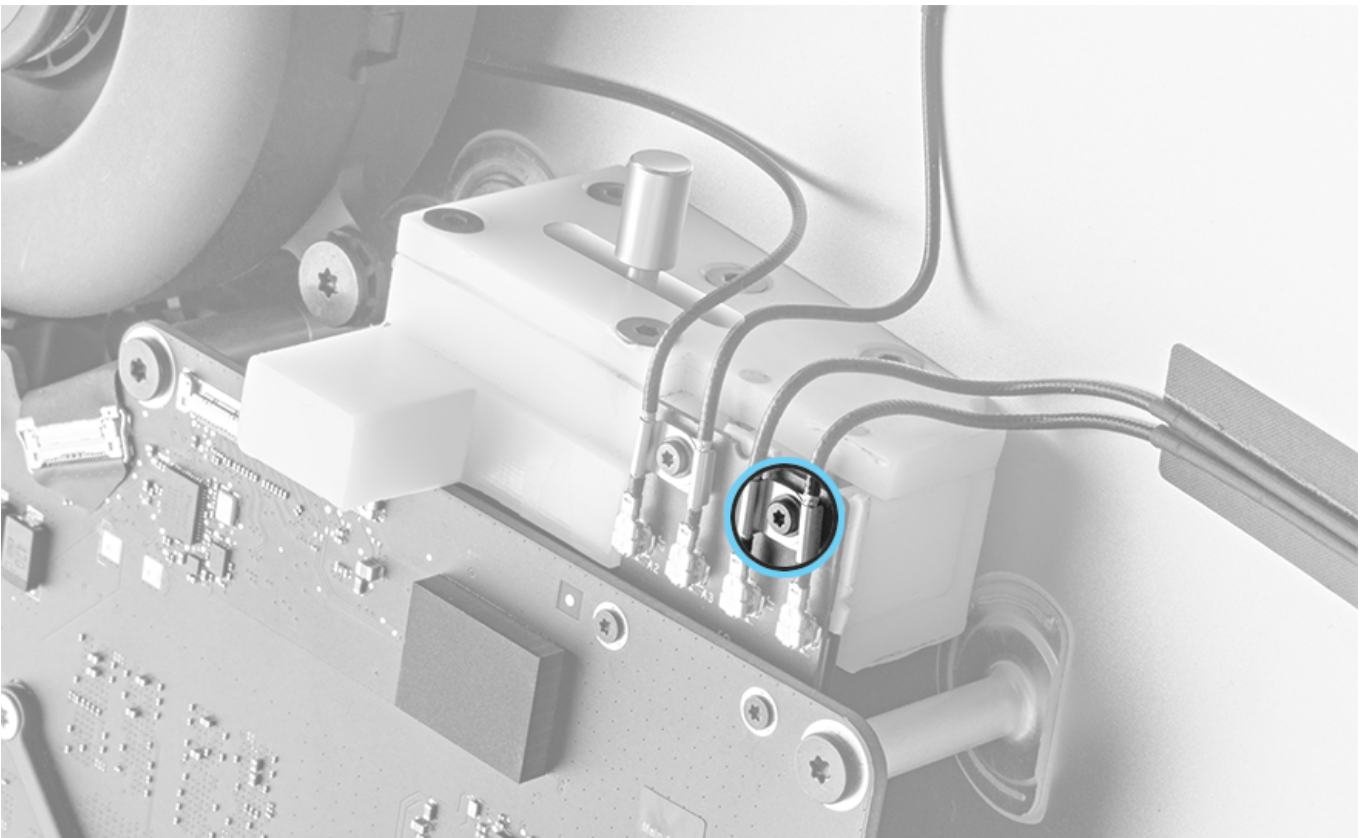


2. Move the lever to the right until the inner block presses against the wireless card.

When positioned correctly, the support tool is held firmly in place and cannot be shifted. Keep the support tool in position while removing or replacing screws and disconnecting or reconnecting antenna cables.

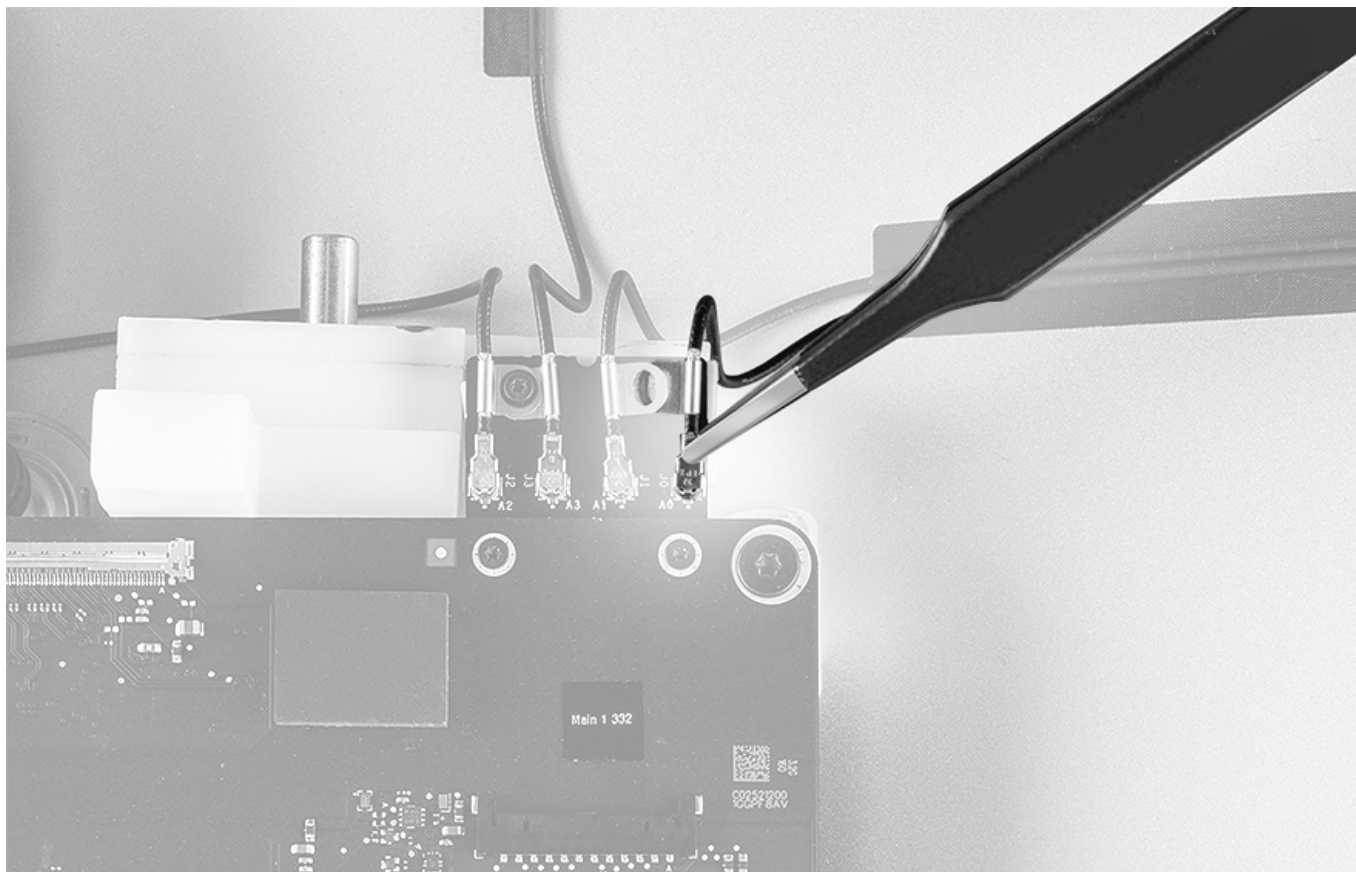


3. Remove the 3.8 mm T5 (923-00609) screw and the washer from the wireless card.



4. Use ESD-safe tweezers to disconnect the connector from the wireless card.

Note: Avoid using a metal tool that could crimp or damage the cable.



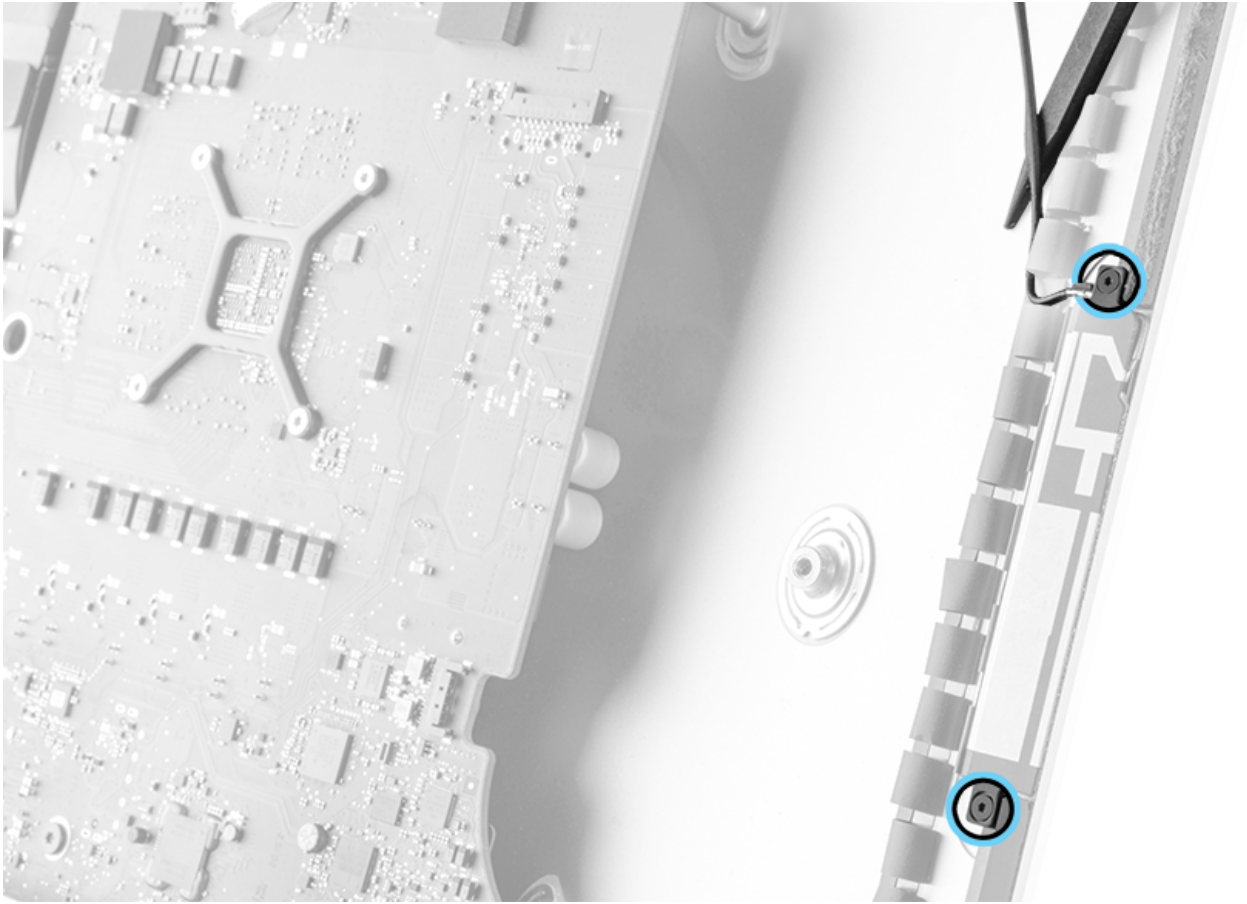
5. Use a black stick to gently unroute the cable and its tape from the rear housing.



6. Remove two T4 (923-0304) screws that secure the antenna body to the rear housing.



7. Remove the lower Wi-Fi antenna from the computer assembly.

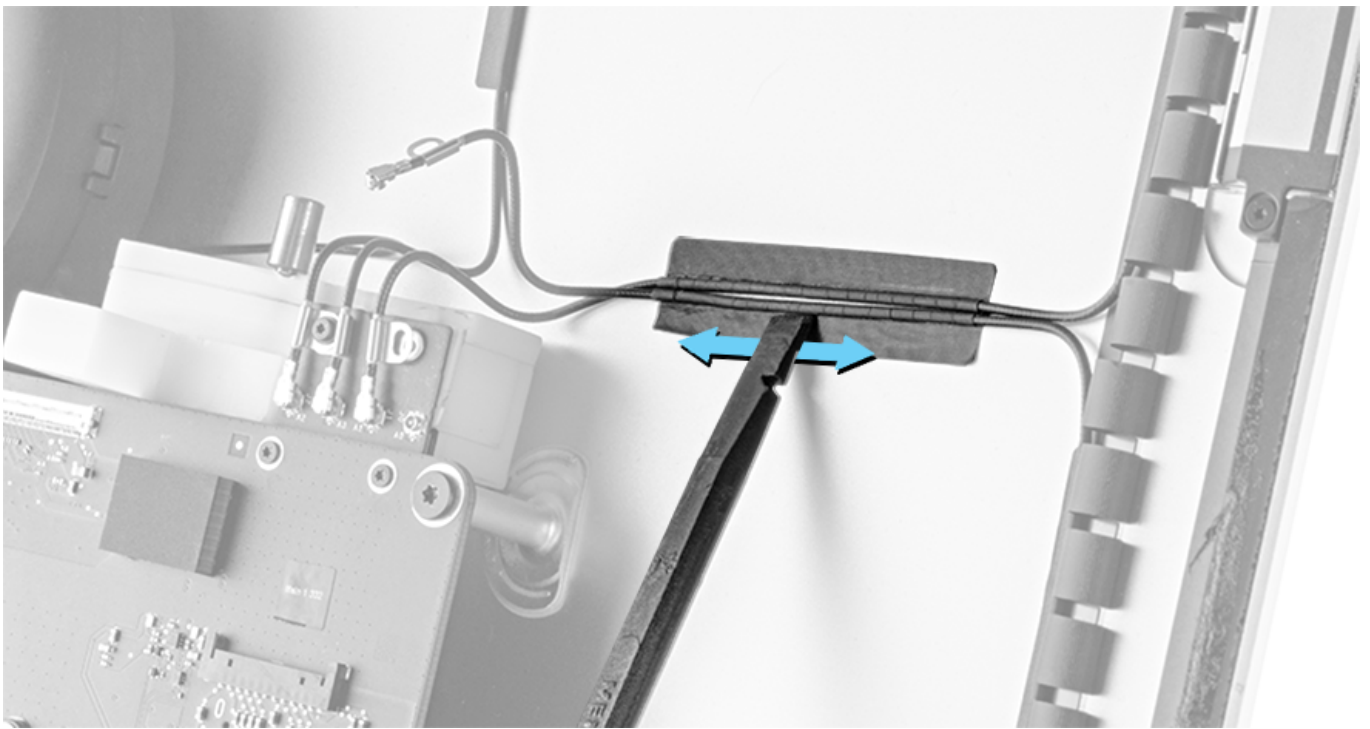


Steps For Reassembly

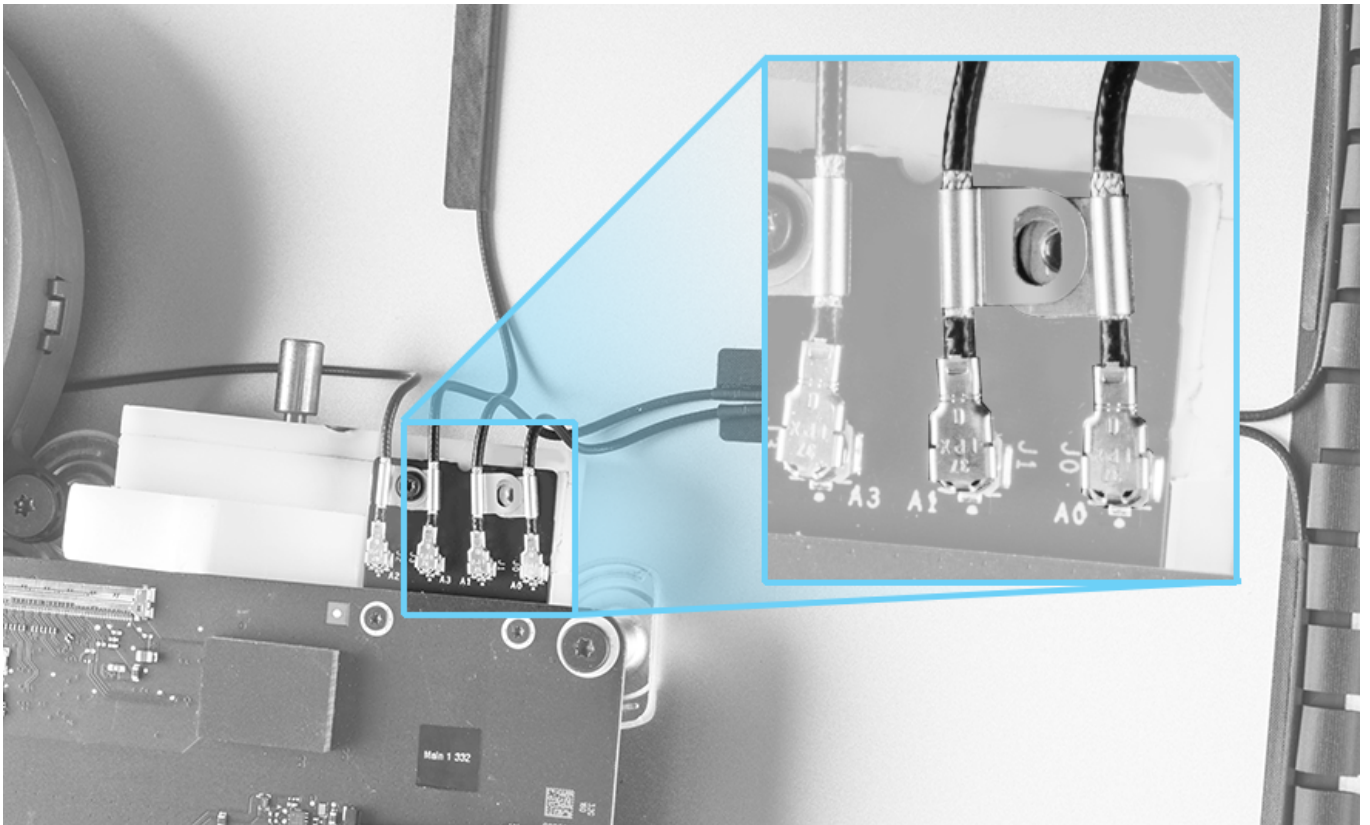
1. Install two T4 screws (923-0304) to secure the antenna body to the rear housing.



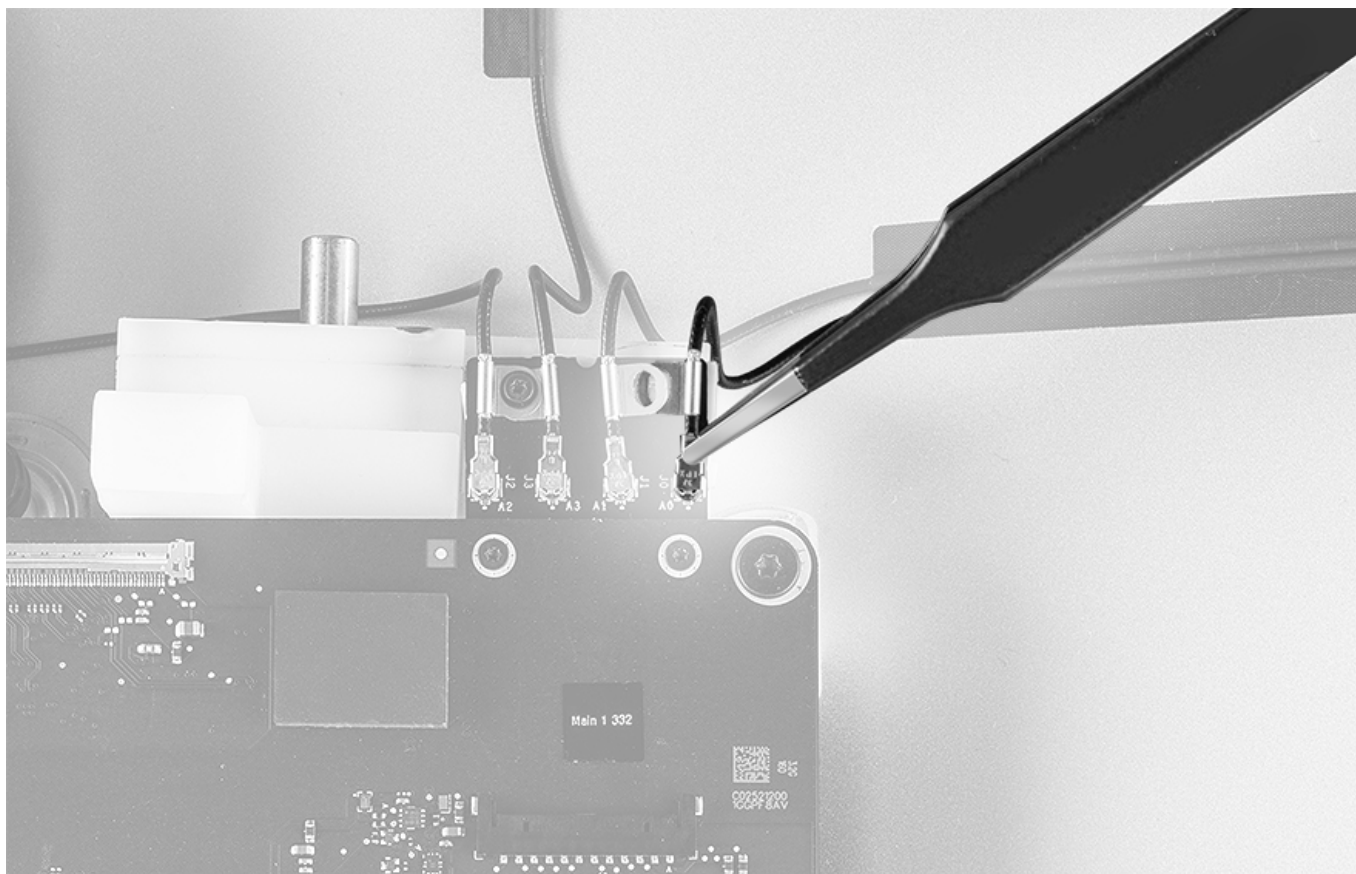
2. Route the antenna cable to the housing. Use the flat end of a black stick to secure the tape.



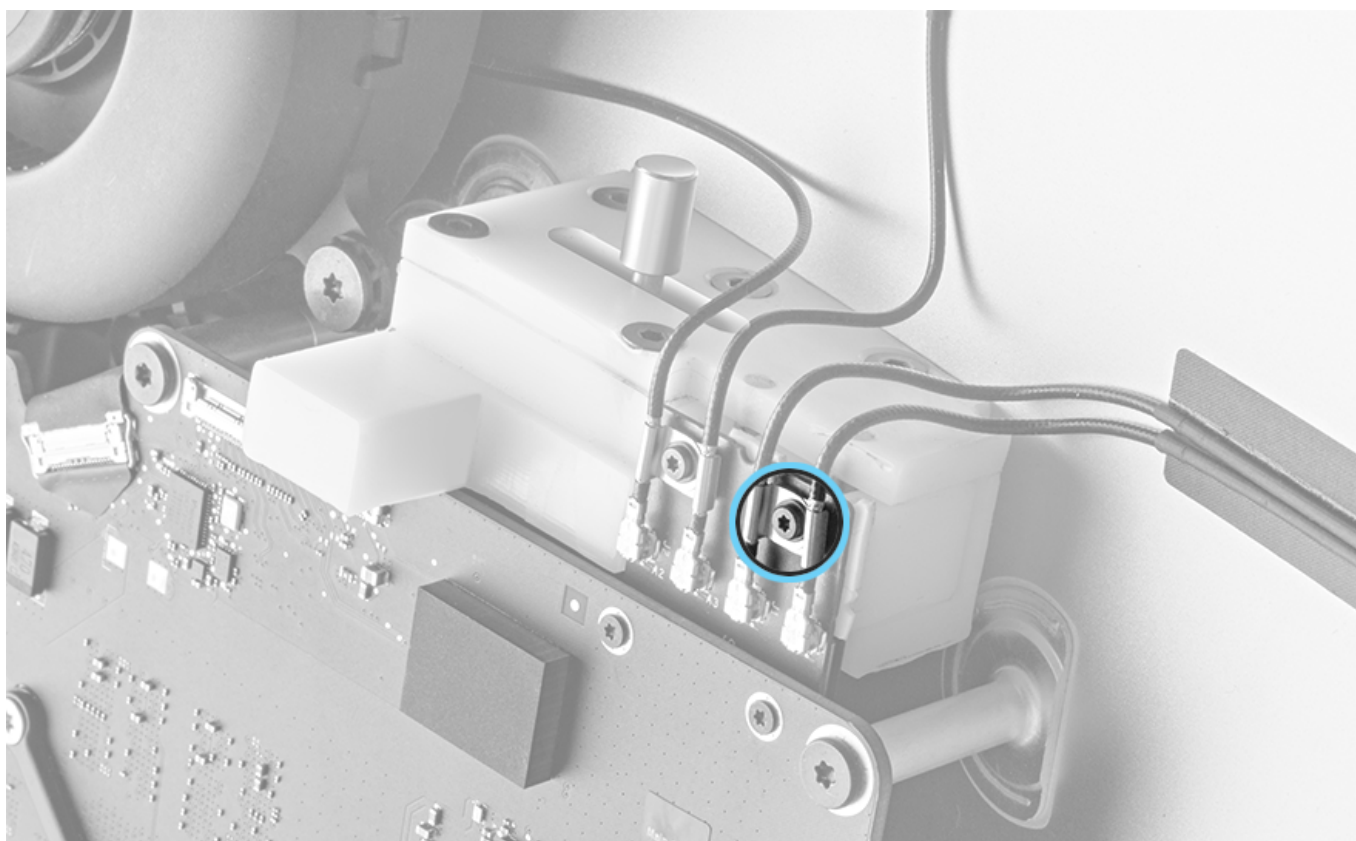
3. Slide the right bracket under the left bracket.



4. Use ESD-safe tweezers to connect the cable to the wireless card.

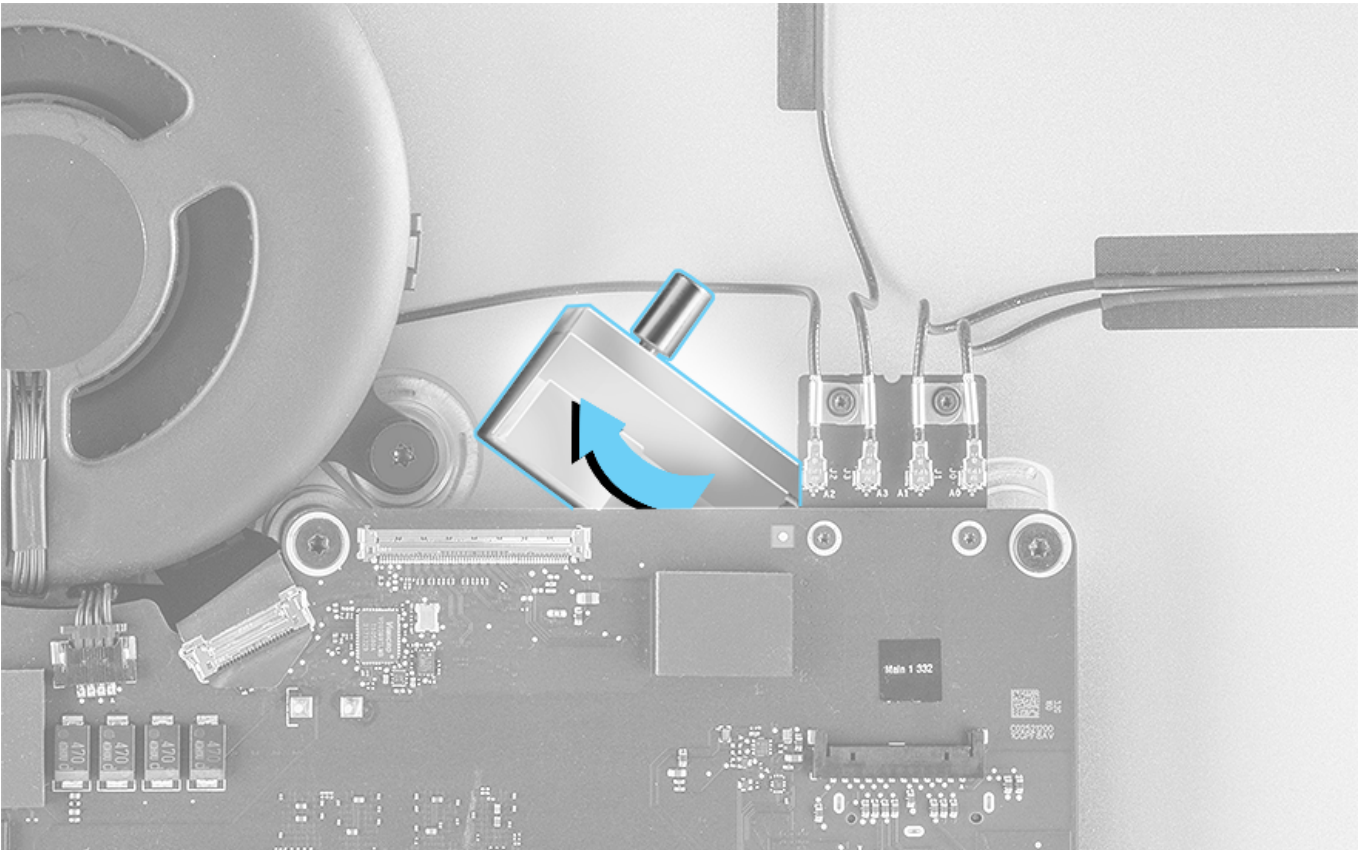


5. Install the 3.8 mm T5 (923-00609) screw and the washer to the wireless card.

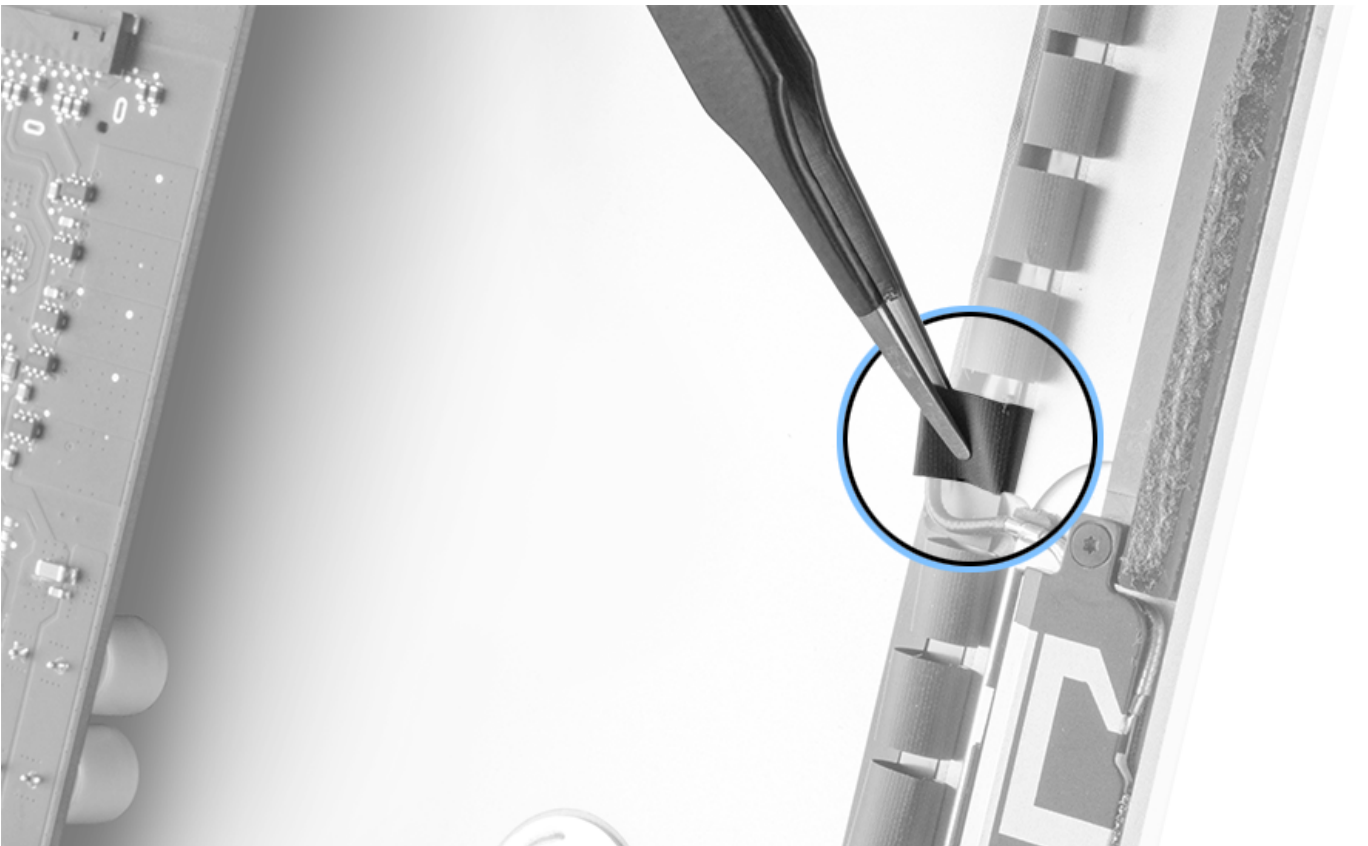


6. Move the lever on the support tool to the left.

7. Remove the support tool from the rear housing.



8. Check the airloop gasket and use a black stick or tweezers to open any flattened loops.



9. Reinstall the [right speaker](#).

10. Reinstall the [chin strap](#).

11. Install new [display panel VHB strips](#).

12. Reinstall the [display panel](#).

Power Supply

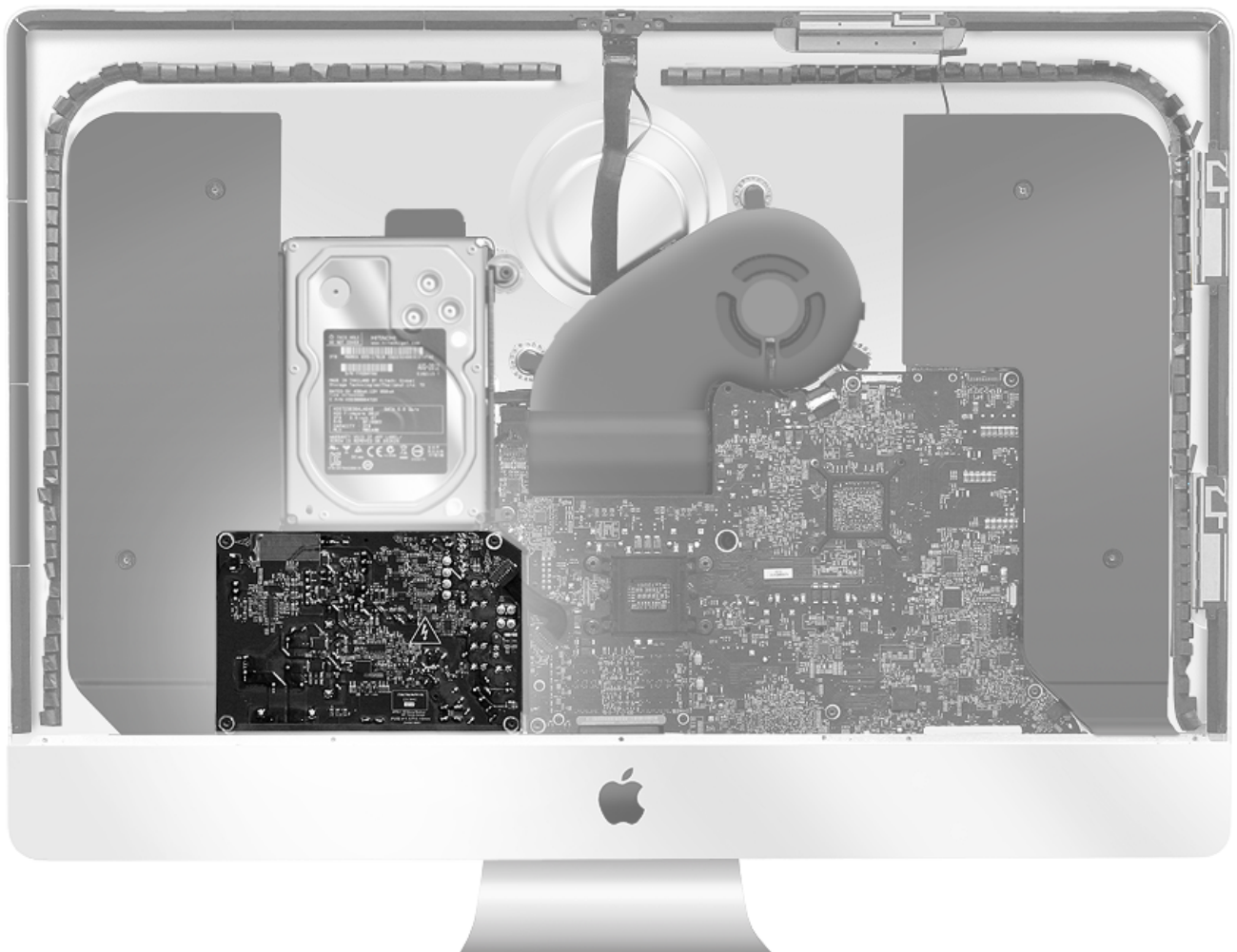
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV246: Power Supply Replacement Video](#).

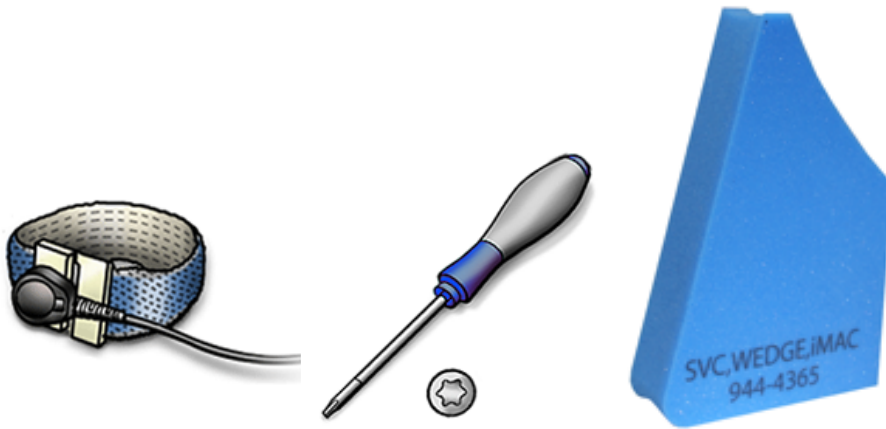
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Chin strap](#)
- [Left speaker](#)
- [Hard drive](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver (magnetized)
- Service wedge (iMac)



Steps For Removal



Warning: HIGH VOLTAGE. Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in, because the power supply retains a charge whether or not the computer is on. Before working on or near the power supply, unplug the power cord from the computer and wait at least two minutes for the electricity to discharge.

- Never remove or install any physical components while the computer is plugged in to an electrical outlet.
- When the computer is plugged in, the power supply and logic board are energized, even when the computer is turned off.
- Unplug the computer and allow sufficient time for the power supply and logic board to self-discharge before removing the display panel.
- Do NOT touch the logic board or power supply while the computer is plugged in, or before sufficient time has passed to discharge the stored voltage to a safe level after the computer has been unplugged.

Warning: After unplugging the computer from the electrical outlet, wait **two** minutes before removing the display panel, disconnecting modules, or substituting cables and components. This will allow the power supply and logic board time to discharge.

iMac (Late 2012 and later) models require two protective covers (923-0189) when performing live adjustments: one for the power supply and one for the backlight control circuitry on the logic board. Secure the covers to the rear housing with tape, as shown in the following articles.

- [TP833: iMac and Displays: Power Supply Cover Instructions](#)
- [TP820: iMac \(27-inch\): Safety](#)

Electrical Safety Precautions

Before working on a computer with exposed, potentially energized parts:

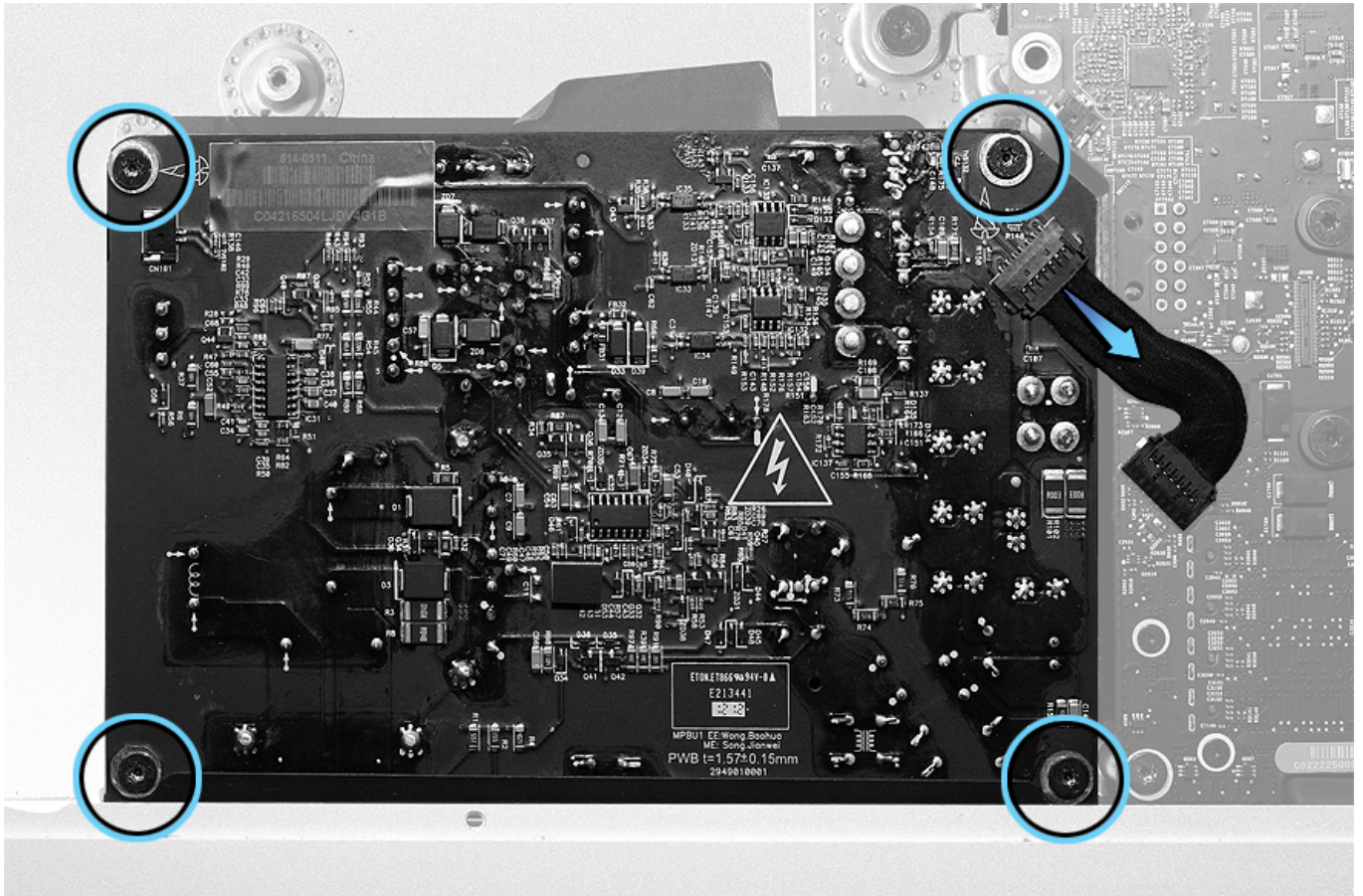
- **Remove rings, watches, necklaces, metal-rimmed eyewear, and other metallic articles** which increase your risk of electric shock.
- **Do not wear a cell phone or other signaling device**, as these may cause a dangerous startle reflex during energized work.
- **If the iMac needs to be plugged in for LED checks or similar troubleshooting, do NOT wear an ESD wrist strap.** Wearing ESD grounding systems increases your risk of electric shock.
- **Remain alert**, focused on the work being performed, and aware of the proximity of grounded objects to your body.
- **Use the plastic black stick or other non-metal extension tool as needed** to connect or disconnect cables, to keep fingers away from potentially energized parts.

1. Disconnect the power signal cable from the power supply, then remove four T10 screws.

- Two 923-0396 (23 mm, along top edge)

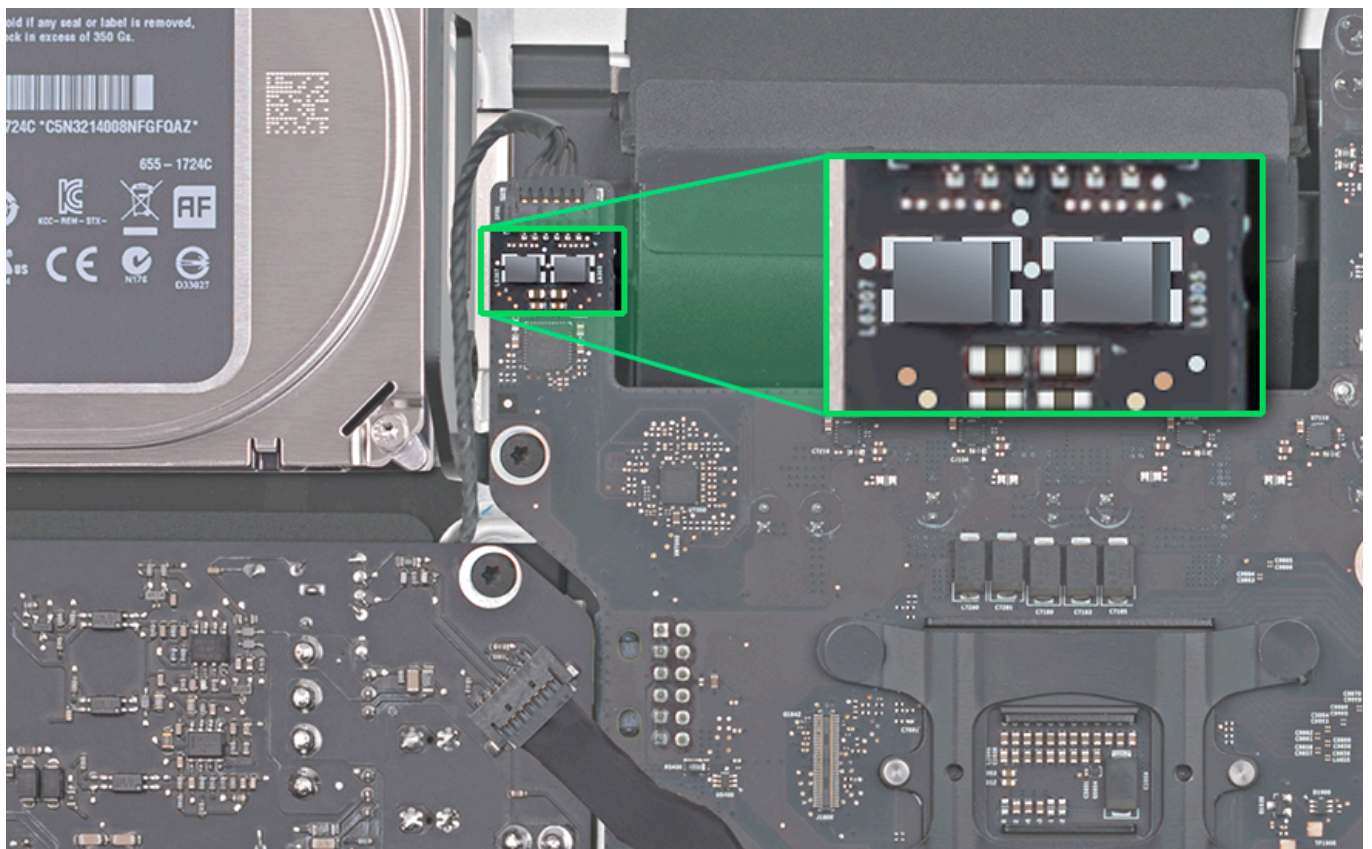


- Two 923-0331 (7.05 mm, along bottom edge near chin)

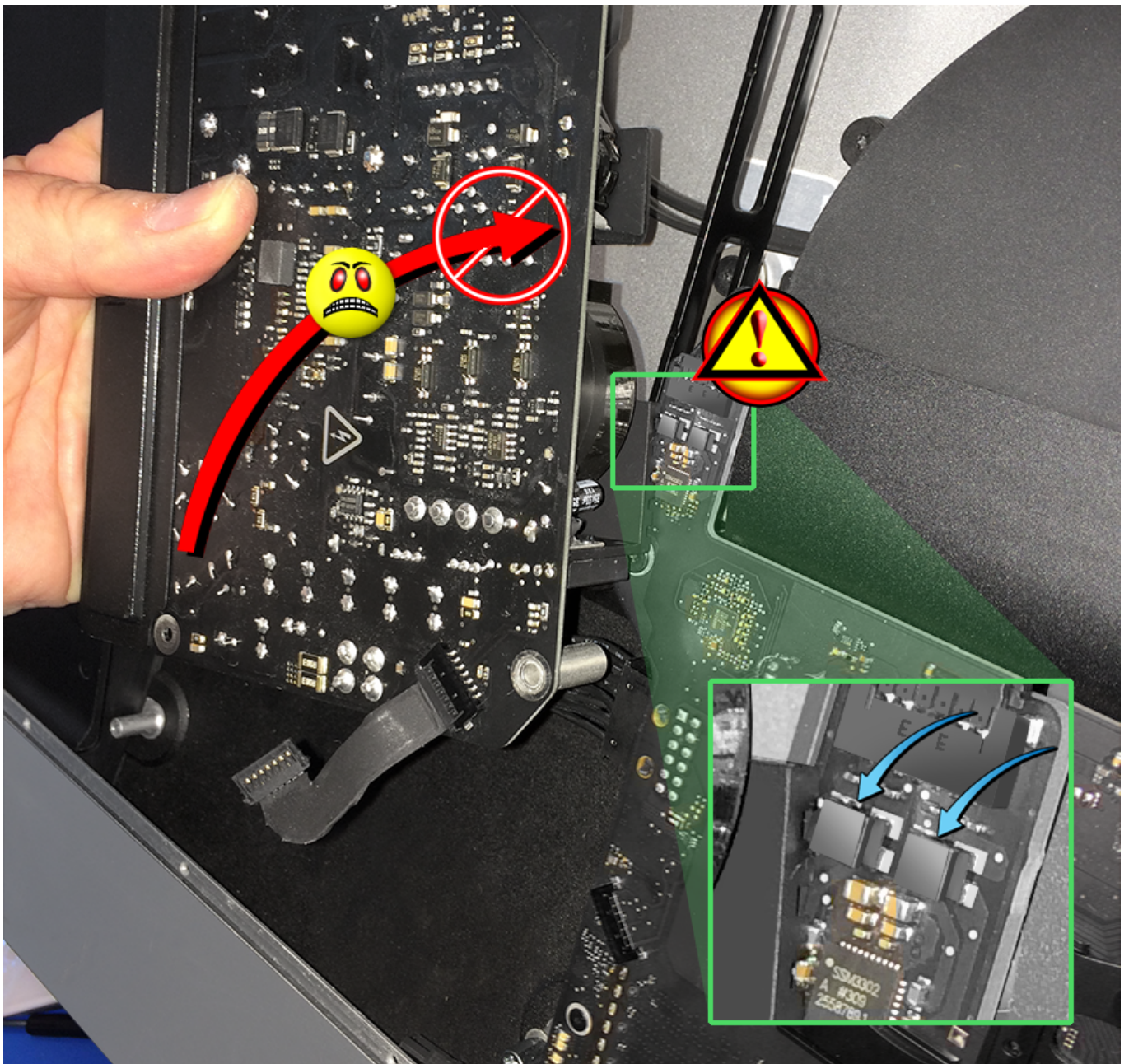


Caution: Do not rotate the power supply clockwise (toward the left speaker connector on the logic board) when attempting to disconnect the DC power cable from the logic board. The heat sink or other large components on the underside of the power supply could potentially make contact with two inductors on the logic board. If the inductors are damaged, then the logic board will need to be replaced.

iMac logic board inductors

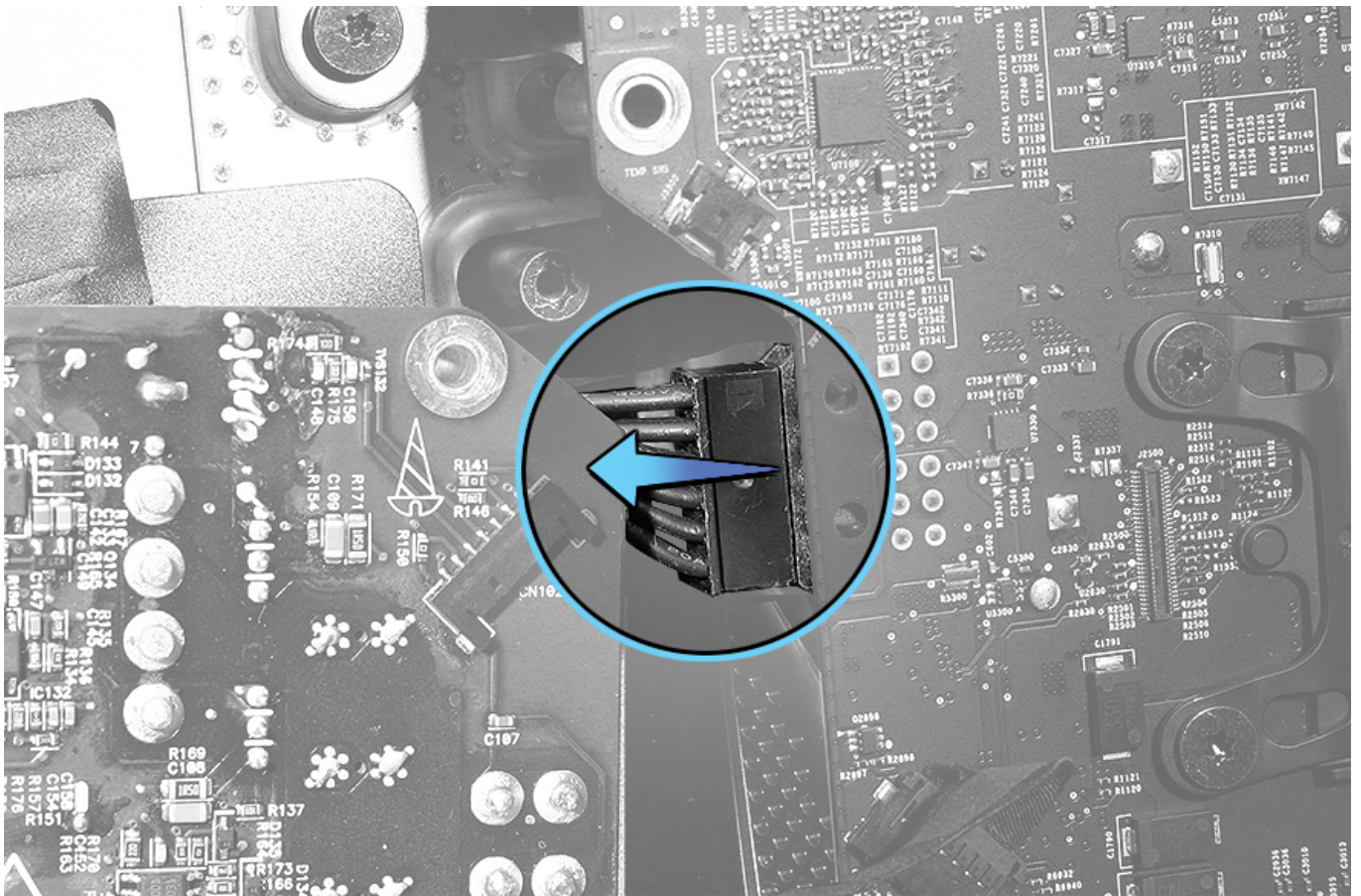


Do not rotate the power supply, as it could make contact with the inductors on the logic board. Remove the power supply as instructed in step 2.



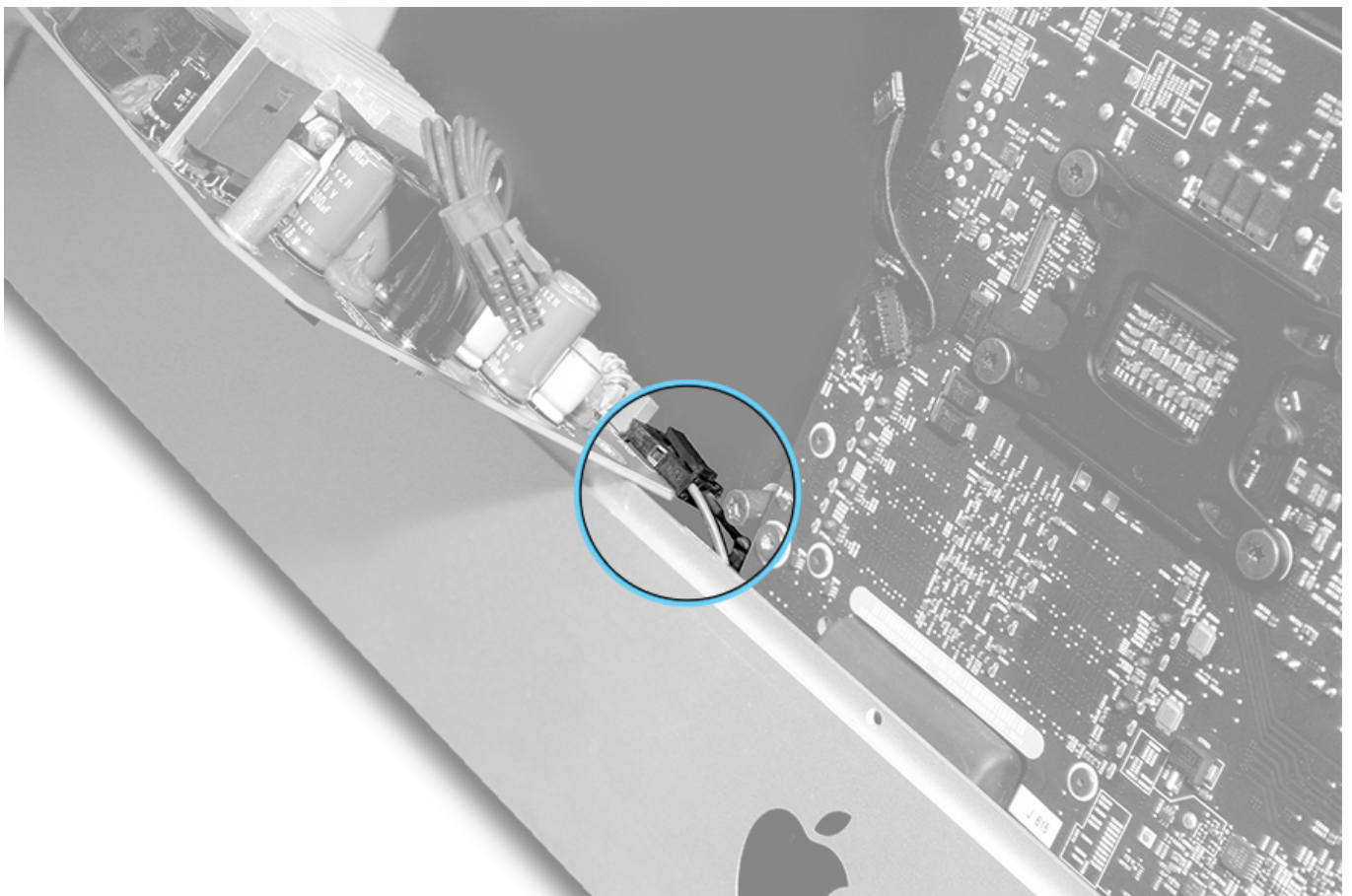
2. Slide the power supply slightly to the left. Reach underneath and disconnect the DC power cable. Pinch the cable connector to release and pull the cable toward the left speaker.

Note: This is a tight connection. Pinch and pull **hard** on the connector, not the cable. Use a black stick (on the underside of the power supply connector) to help release the latch on the connector.



3. Tilt the power supply slightly to disconnect the AC power cable. Pinch and pull the connector to the right.

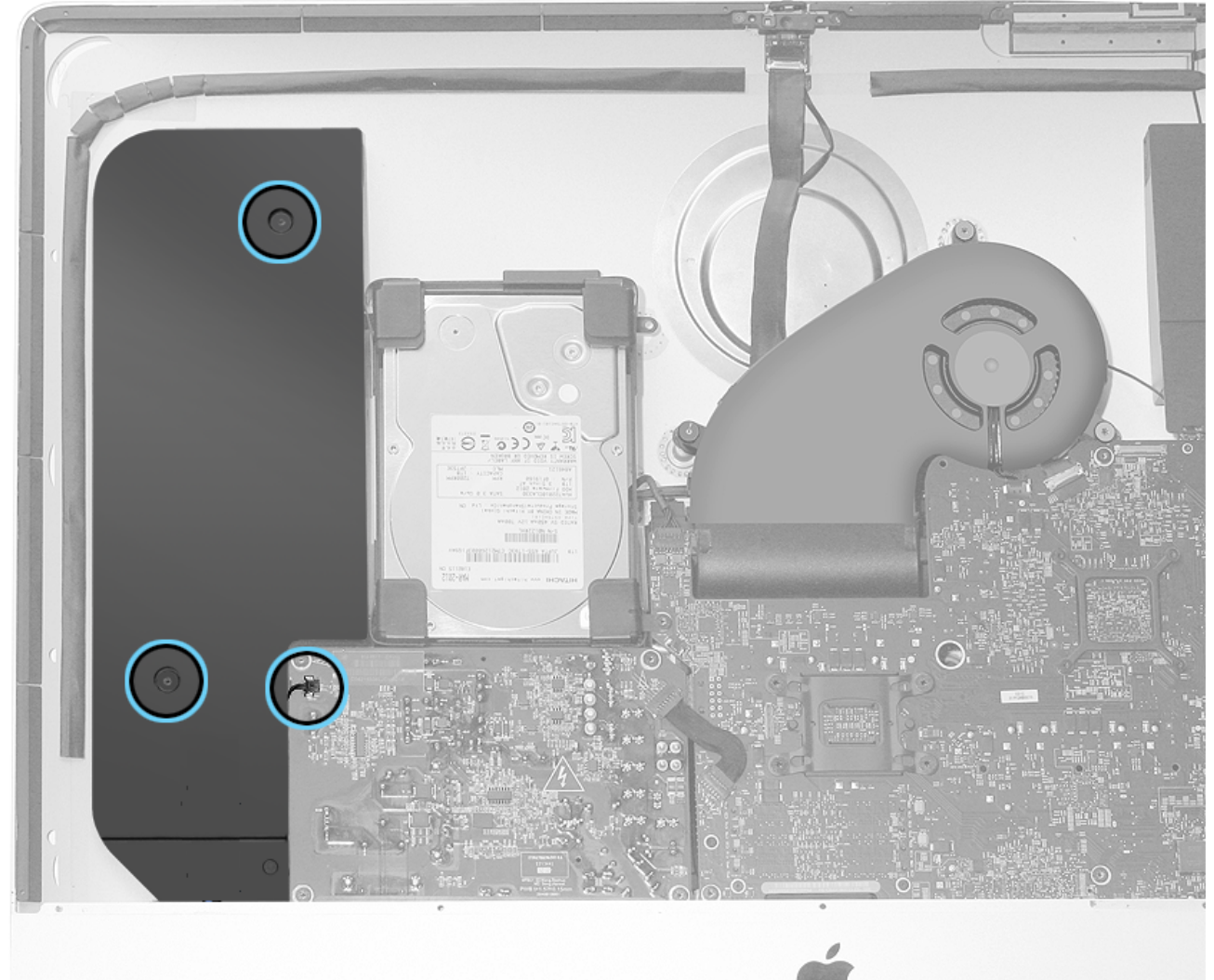
4. Lift the power supply out of the rear housing.



Steps For Reassembly

1. Lower the power supply into the rear housing and connect the AC cable.

2. Connect the DC power cable to the logic board. Check that the cable is securely connected.
3. Reinstall four power supply screws (replace the two long screws at the top **first**, then the two shorter screws at the bottom, near the chin).
4. Connect the power signal cable to the power supply and logic board.
5. Reinstall the [hard drive](#).
6. Reinstall the [left speaker](#). **Note:** Do not forget to connect the power-on button cable to the power supply.



7. Reinstall the [chin strap](#).
8. Install new [display panel VHB strips](#).
9. Reinstall the [display panel](#).

Power Supply Signal Cable

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

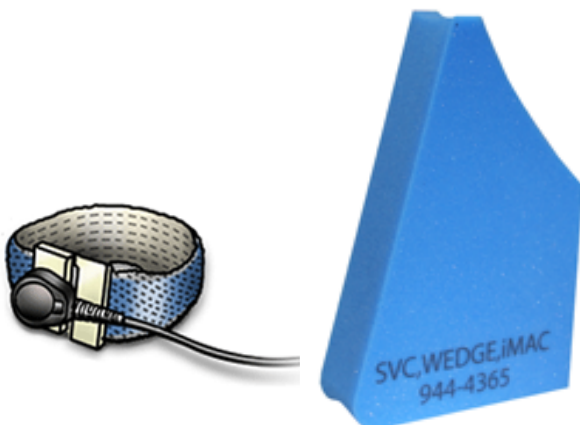
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)



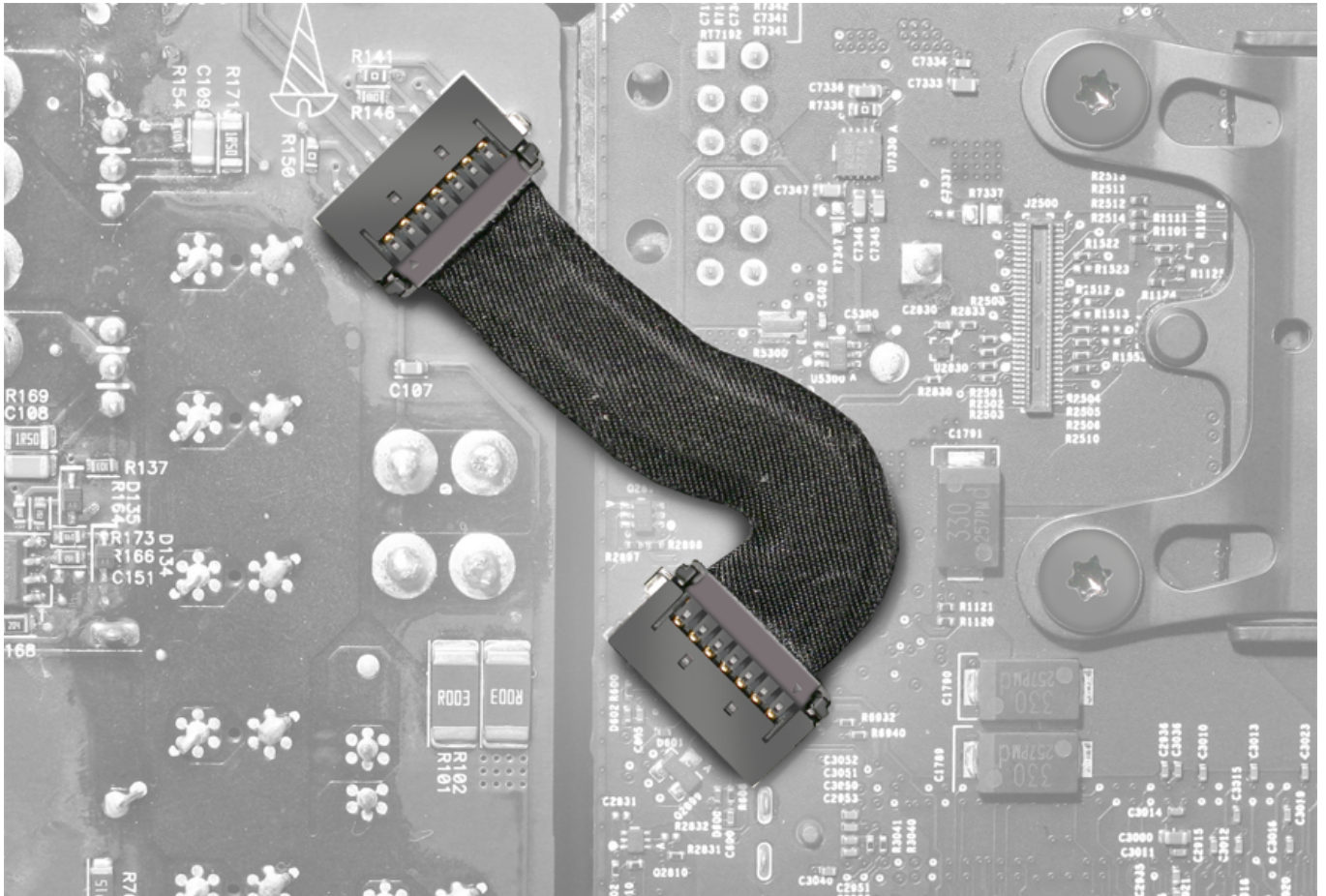
Tools

- ESD wrist strap and mat
- Service wedge (iMac)



Steps For Removal

1. Disconnect the power supply signal cable from the power supply and the logic board.



Steps For Reassembly

1. Connect the power supply signal cable to the power supply and the logic board.
2. Install new [display panel VHB strips](#).
3. Reinstall the [display panel](#).

Logic Board

First Steps

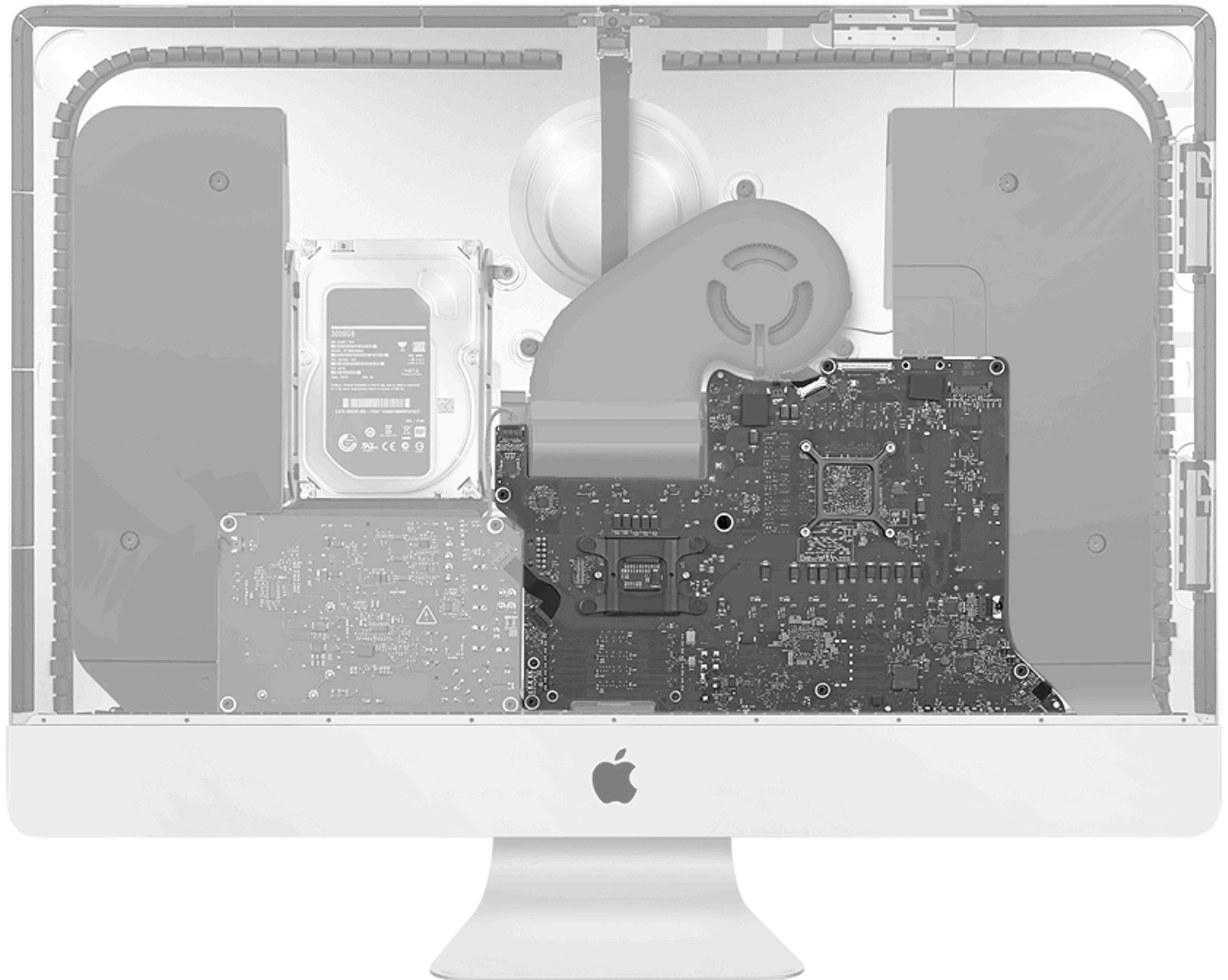
Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV245: Logic Board Replacement Video](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)

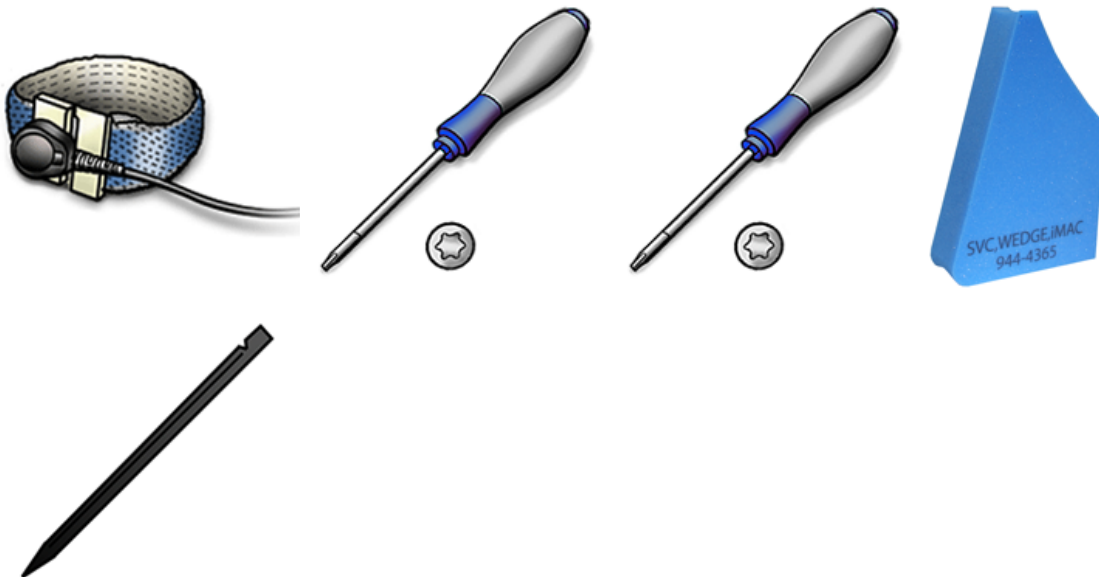
iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)

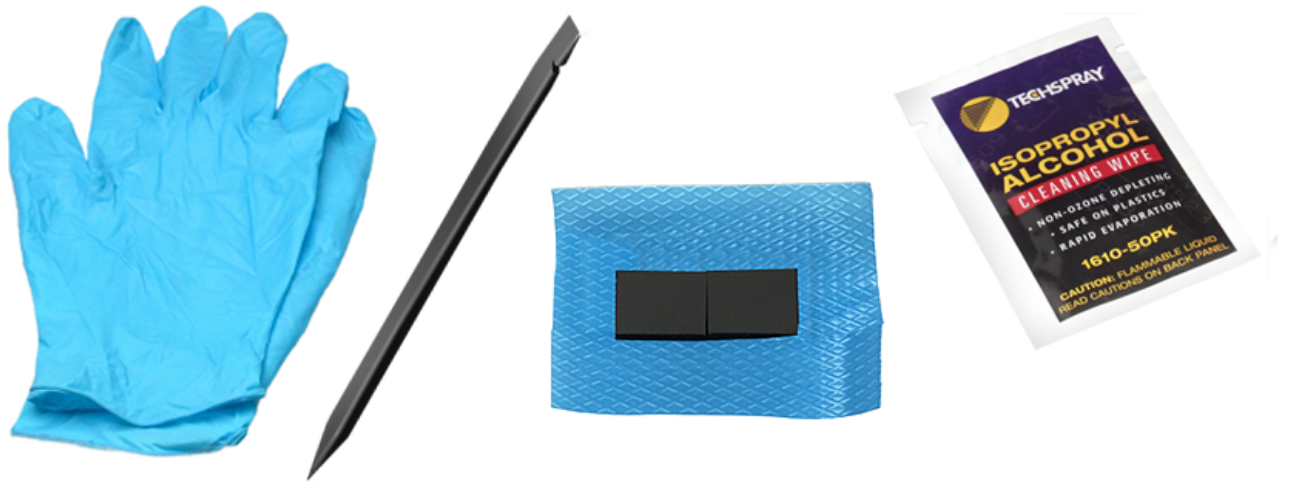


Tools



- ESD wrist strap and mat
- Torx T10 screwdriver
- Torx T25 screwdriver
- Service wedge (iMac)
- Black stick
- Two Mini DisplayPort or Thunderbolt cables and one USB cable for reassembly (not pictured)

If removing or replacing the wireless card on the iMac (27-inch, Late 2012) model, you will need the following tools:



- Nitrile gloves (use when cleaning twinpak thermal material)
- Black stick
- Thermal pad kit, 076-1445 (replaces the twinpak thermal material)
- Isopropyl alcohol (IPA) wipes

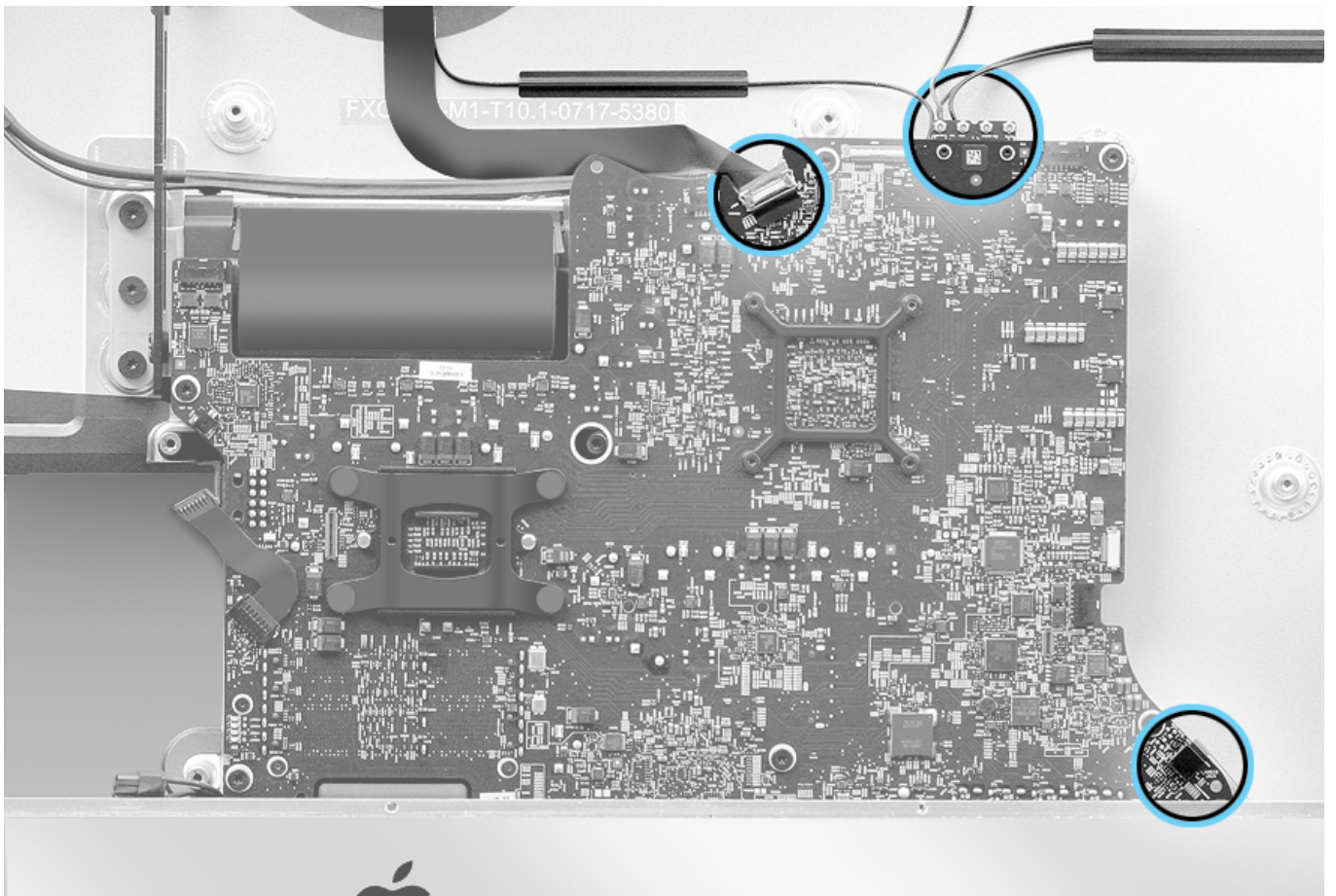
Note: On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (21.5-inch, Late 2012 and Early 2013) and iMac (27-inch, Late 2012) models. The thermal pad kit is included with the wireless card and logic board replacement parts on these models. On the iMac (21.5-inch, Late 2013 and later) and iMac (27-inch, Late 2013 and later) models, the thermal pad is included with the just the wireless card. The thermal pad kit is also available separately (076-1445).

Whenever you remove or replace the wireless card in an iMac (21.5-inch, Late 2012 and Early 2013) or iMac (27-inch, Late 2012) model, check for a dollop of original thermal material. If it is present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.

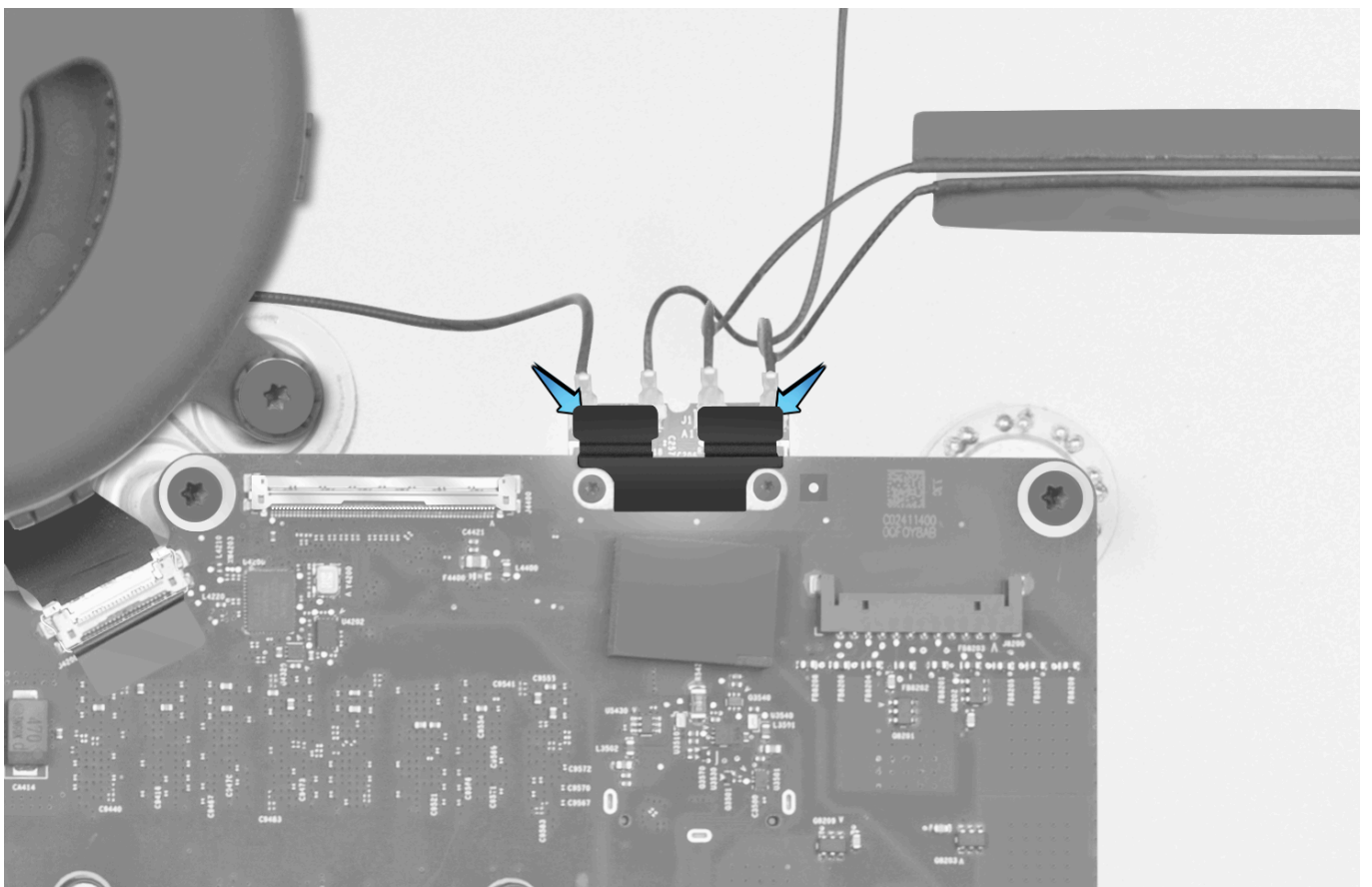
Steps For Removal

1. Carefully disconnect the following from the logic board:

- Camera/microphone locking-lever bar (top center of the logic board – flip the bar toward the cable)
- Antennas from the wireless card (top right of the logic board)
- Audio connector (lower right corner of the logic board)



Note: iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) has Mylar tape securing the antenna connectors to the wireless card. Use a black stick to peel the tape forward to access the antenna connectors.



2. Remove eight T10 screws and one T25 standoff, and completely unscrew one T10 captive screw in the center of the board.

Screw legend:

- S = T10 short screw x 4
 - 923-0331, short



- SS = T10 short shoulder screw x 2
 - 923-0395, short shoulder



- L = T10 long screw x 2
 - 923-0396, 23 mm, long



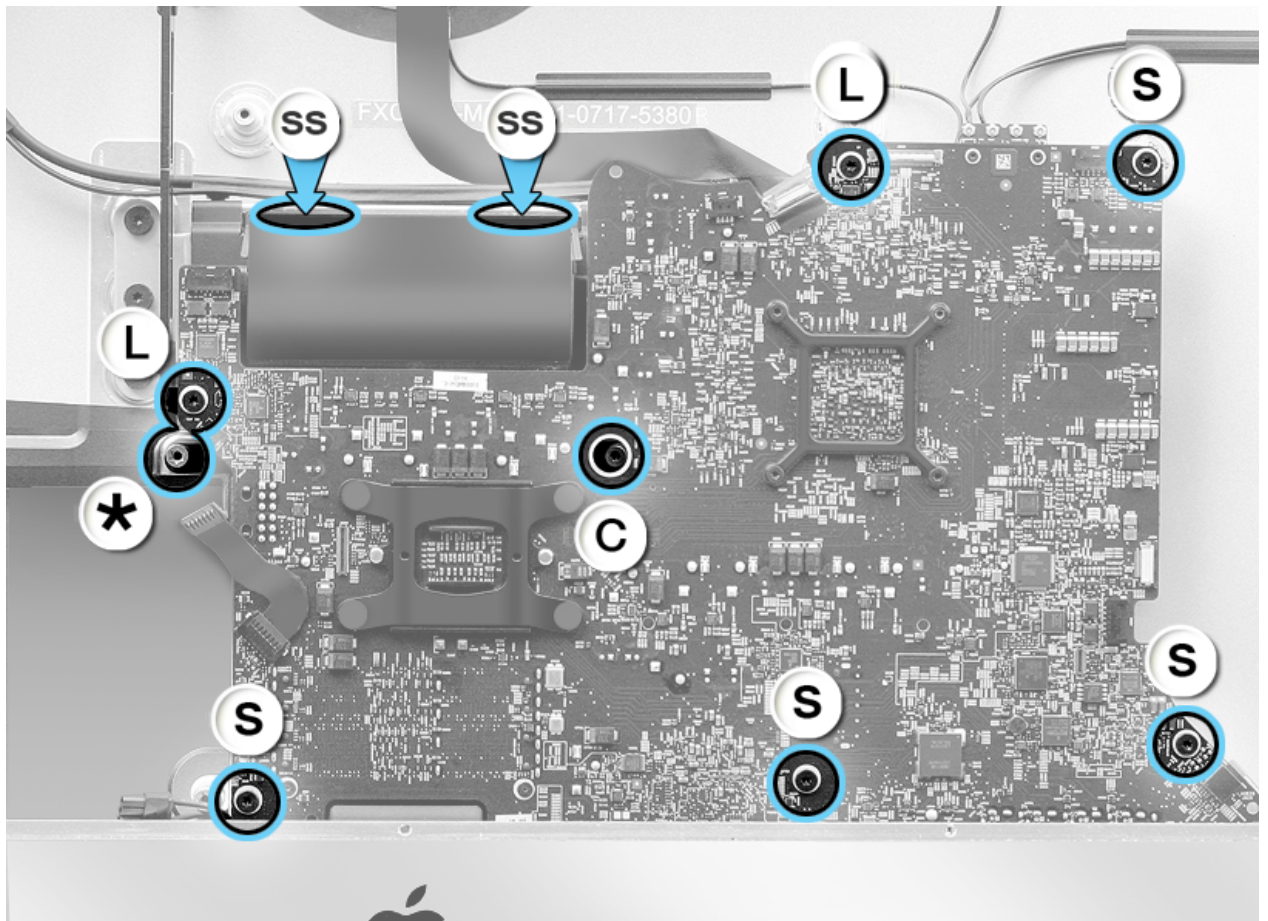
- * = T25 standoff x 1 (black, in Late 2012 model)
 - 923-0373, PSU standoff



- * = T25 standoff x 1 (with shorter thread)
 - 923-0520, PSU standoff



- C = T10 captive screw x 1 (located in the middle of the board, image not shown)
 - **Note:** The captive screw is not available separately.



3. Carefully tilt the board forward. Disconnect the hard drive data (upper connector) and power cable (lower connector) from the two connectors on the back of the logic board. Pull the data end of the cable toward the rear housing. Pinch the clip on the power cable connector and pull toward the rear housing.



4. With two hands, carefully lift the logic board from the rear housing. **Caution:** Handling the logic board incorrectly can damage chips and circuits. Be extremely careful when removing and replacing the logic board. Components that contact the enclosure, standoffs, or other modules may cause damage and prevent the iMac from operating correctly.

Handling the Logic Board

- Always handle the logic board by its edges.
- Never handle the logic board by the heat sink.

5. Verify that the tamper indicator labels on the heat sink are intact. If labels have been removed or tampered with, the logic board is not eligible for exchange.

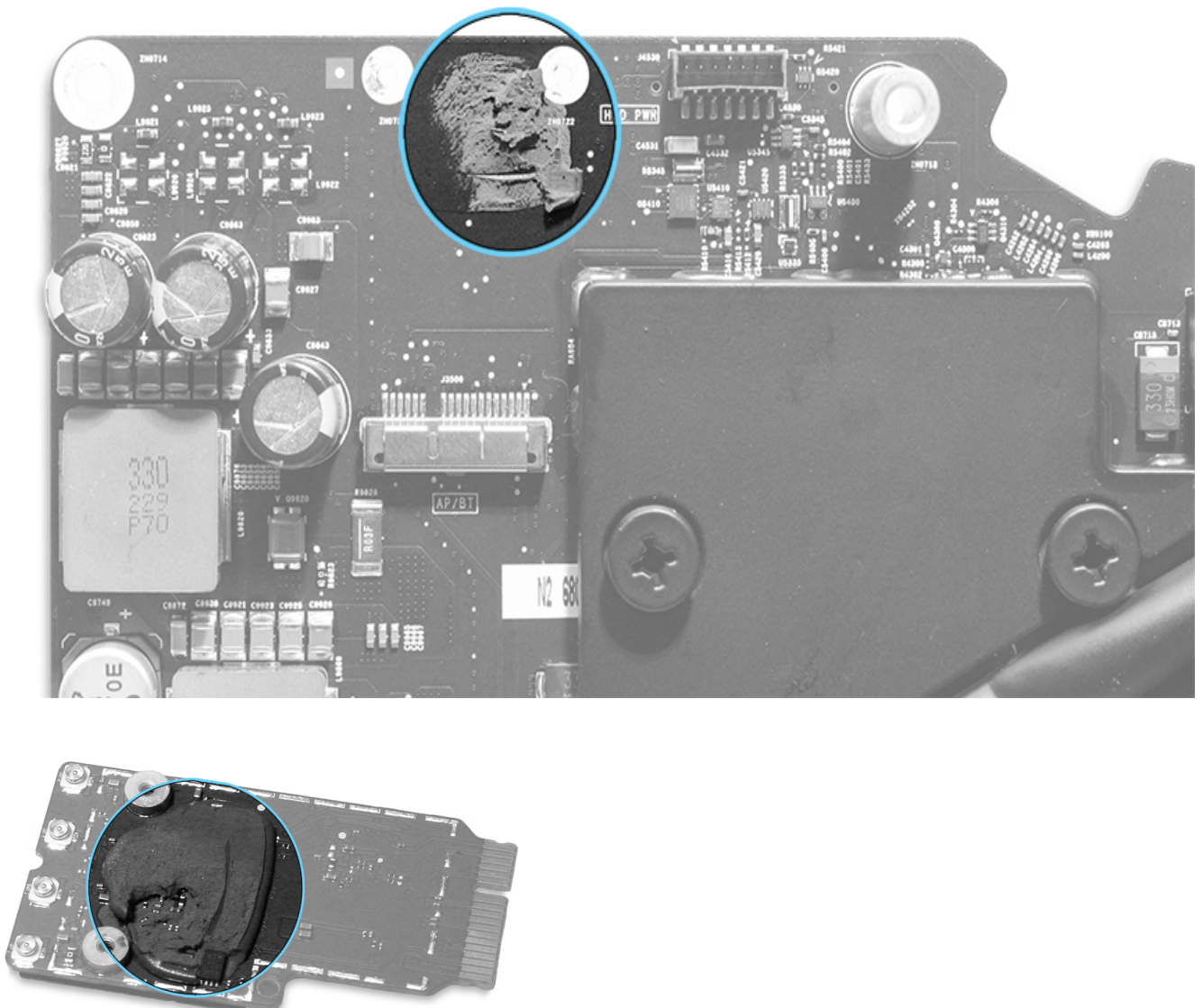
Steps For Reassembly

1. If installing a replacement logic board, transfer these parts from the old logic board:

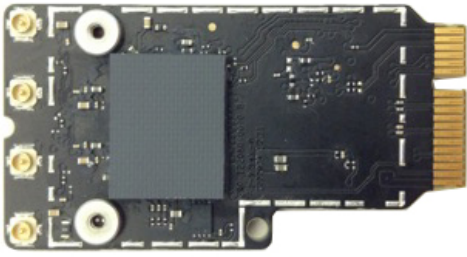
- hard drive data and power cable
- memory
- power supply signal cable (short black cable that connects to the power supply and logic board)
- wireless card (apply thermal pad before installing)
- flash storage (if present) for Fusion Drive configurations

2. If thermal material is present on an iMac (27-inch, Late 2012) model, use a black stick to **carefully** remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card. The iMac (27-inch, Late 2013 and later) models are manufactured with a thermal pad. On the Late 2013 and later models, transfer the pad to the wireless card. If the pad is damaged, install a new pad. **Note:** The thermal pad kit is included with the wireless card replacement part **only** for the iMac (27-inch, Late 2013 and later) models. Refer to article [RP966: Wireless Card](#).

Logic board and wireless card with thermal material



Wireless card with thermal pad



3. Insert the logic board into the rear housing. **Caution:** Handling the logic board incorrectly can damage chips and circuits. Be extremely careful when removing and replacing the logic board. Components that contact the enclosure, standoffs, or other modules may cause damage and prevent the iMac from operating correctly.

4. Connect the hard drive data and power cable to the back of the logic board.

5. Align the connectors with the ports, place the logic board screws, and partially tighten the screws to keep them in place – **but do not fully tighten the screws at this point.**

Screw legend:

- S = T10 short screw x 4
 - 923-0331, short



- SS = T10 short shoulder screw x 2
 - 923-0395, short shoulder



- L = T10 long screw x 2
 - 923-0396, 23 mm, long



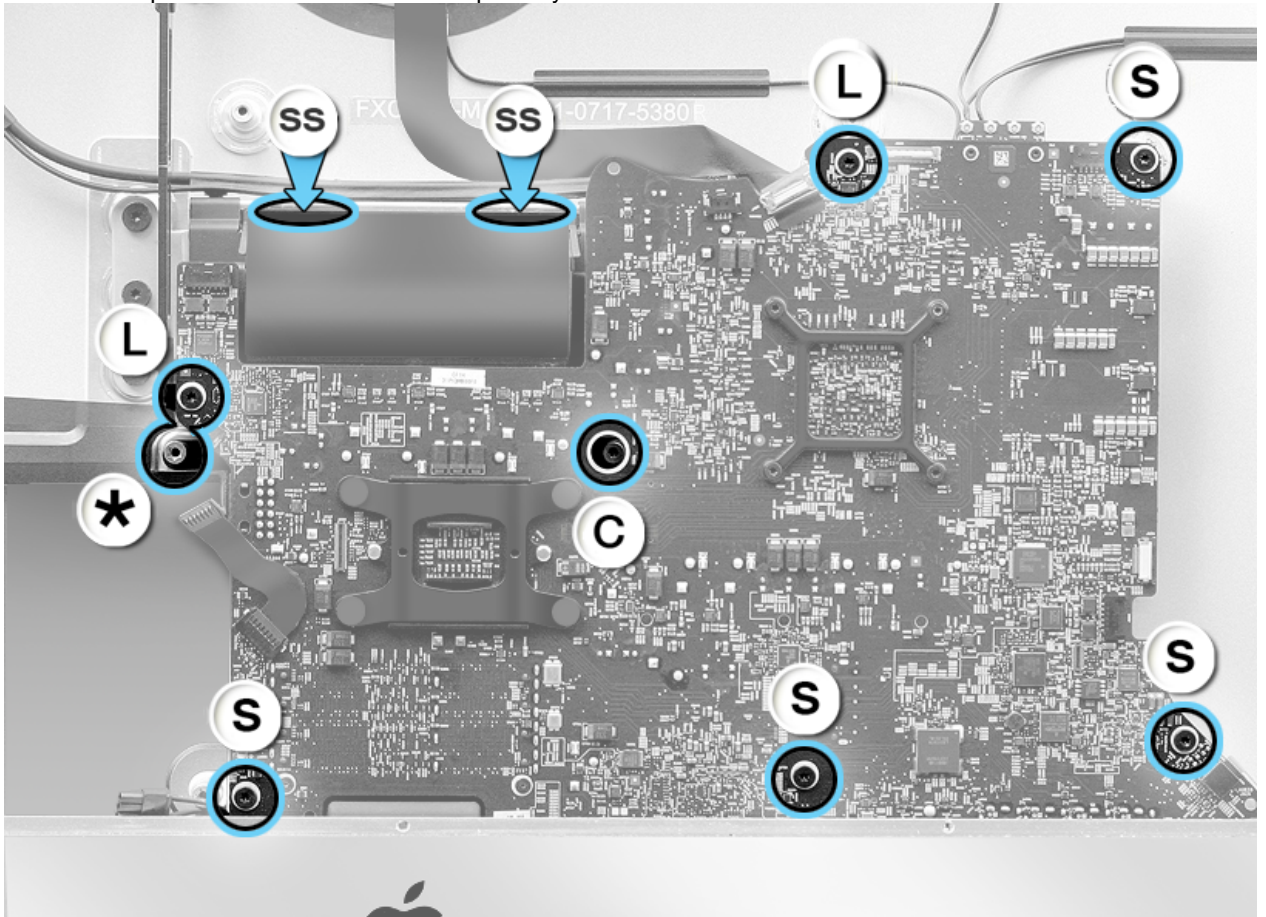
- * = T25 standoff x 1 (black, in Late 2012)
 - 923-0373, PSU standoff



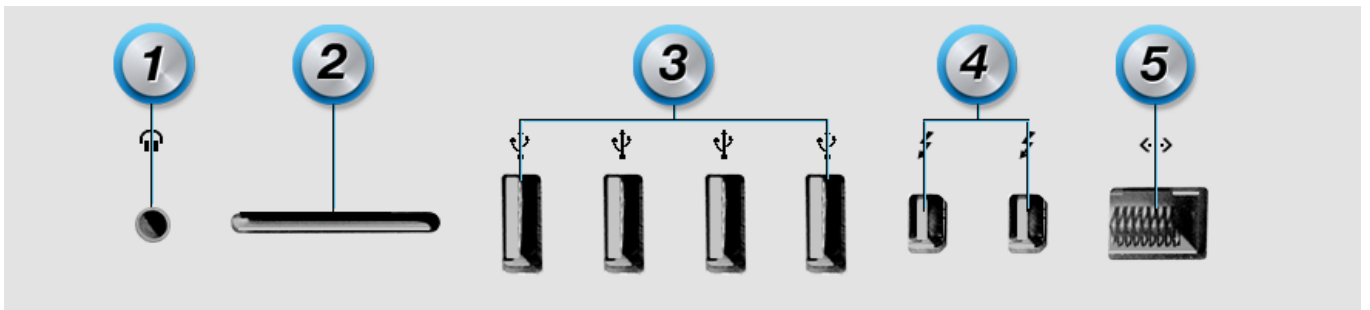
- * = T25 standoff x 1 (with shorter thread)
 - 923-0520, PSU standoff



- C = T10 captive screw x 1 (located in the middle of the board, image not shown)
 - **Note:** The captive screw is not available separately.



6. To ensure correct logic board alignment with the rear housing, plug in one USB cable (#3) and two Thunderbolt cables (#4) while tightening the logic board screws.



7. Connect the camera/microphone cable, wireless antennas, and audio cable.

If you have installed a replacement logic board:

8. Apply a new Ethernet ID label (included in box with new logic board) to the bottom of the stand.

9. Use Blank Board Serializer (BBS) to set the computer's serial number after the computer has been reassembled. BBS can be run from AST 1 or AST 2, or as a stand-alone, USB-based version found in article [SD63: Blank Board Serializer](#).

- For more information about AST and supported Mac models, see article [OP476: Latest Apple Service Toolkit download links and documentation](#).
- **Important:** When using BBS in AST 1 or AST 2, ensure that the unit under test (UUT) and the AST server are connected to the same network, and that the AST server has the latest software version installed.

Logic Board

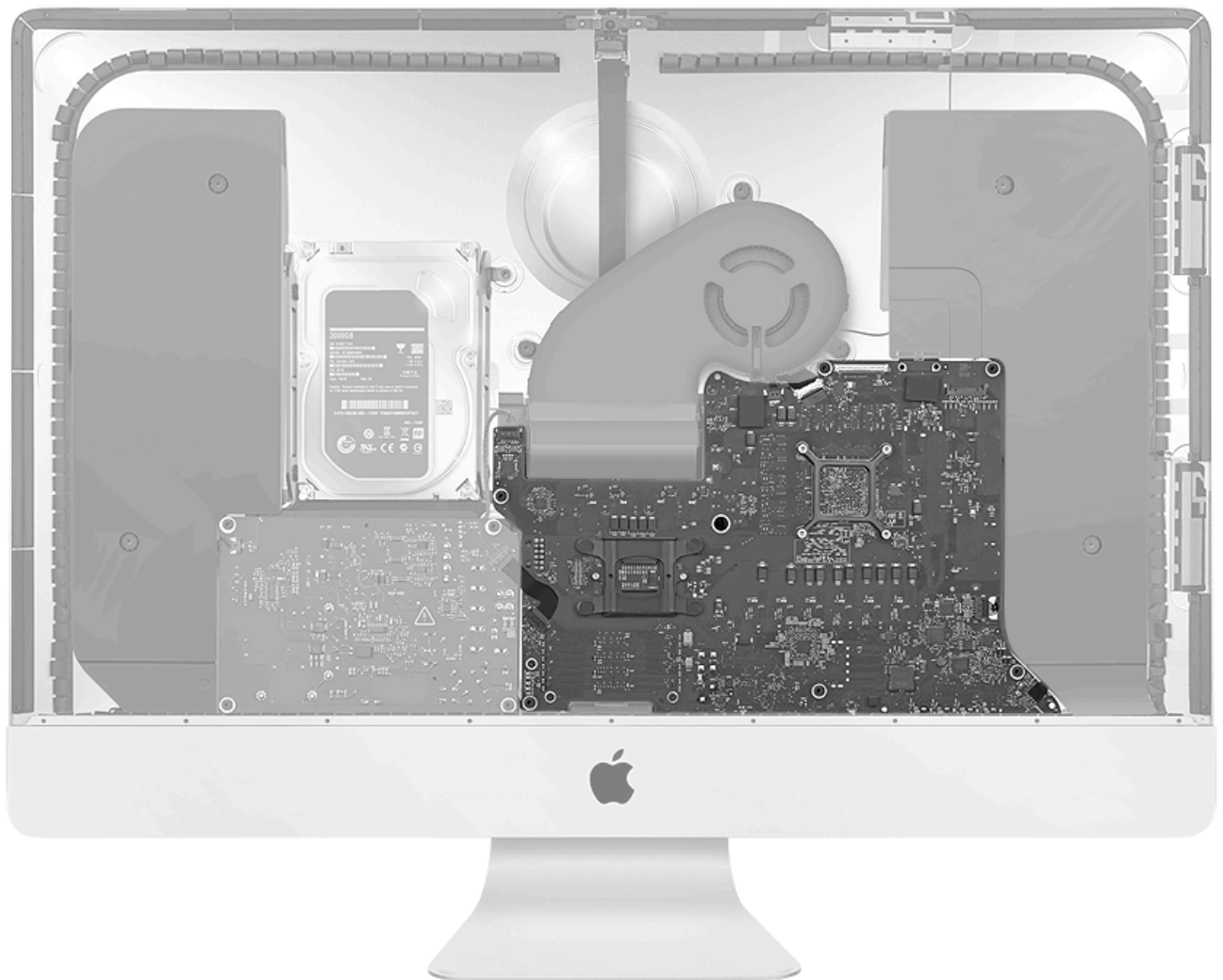
First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: About AppleCare service certifications](#).

For video instruction, refer to article [SV245: Logic Board Replacement Video](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)

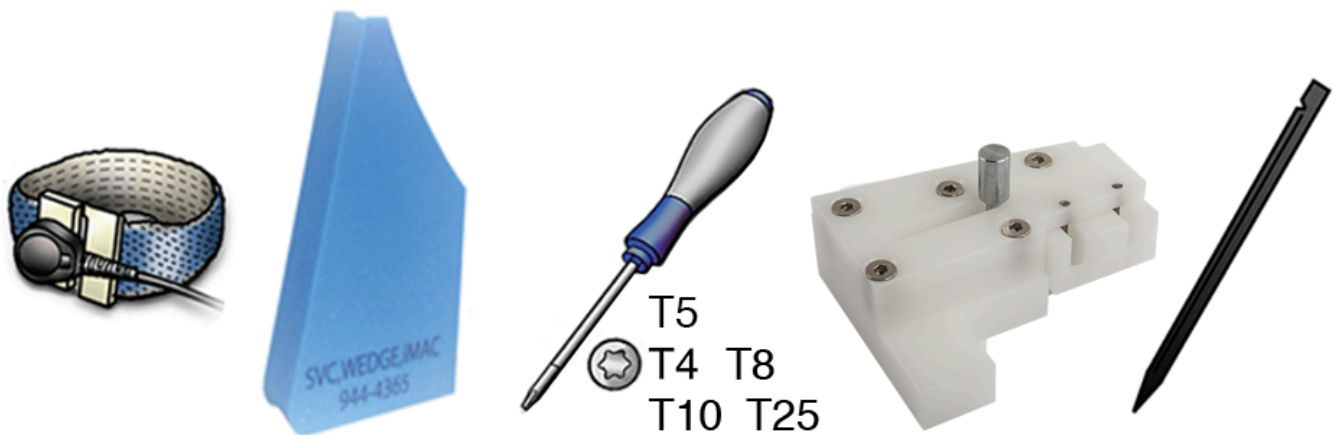


Tools

- ESD wrist strap and mat
- Torx T4 screwdriver (for wireless card removal)
- Torx T5 screwdriver
- Torx T8 screwdriver
- Torx T10 screwdriver
- Torx T25 screwdriver
- Service wedge (iMac)
- Black stick
- Wireless card support tool
- Two Mini DisplayPort or Thunderbolt cables and one USB cable for reassembly (not pictured)

If you are replacing the wireless card, the following tools will also be needed:

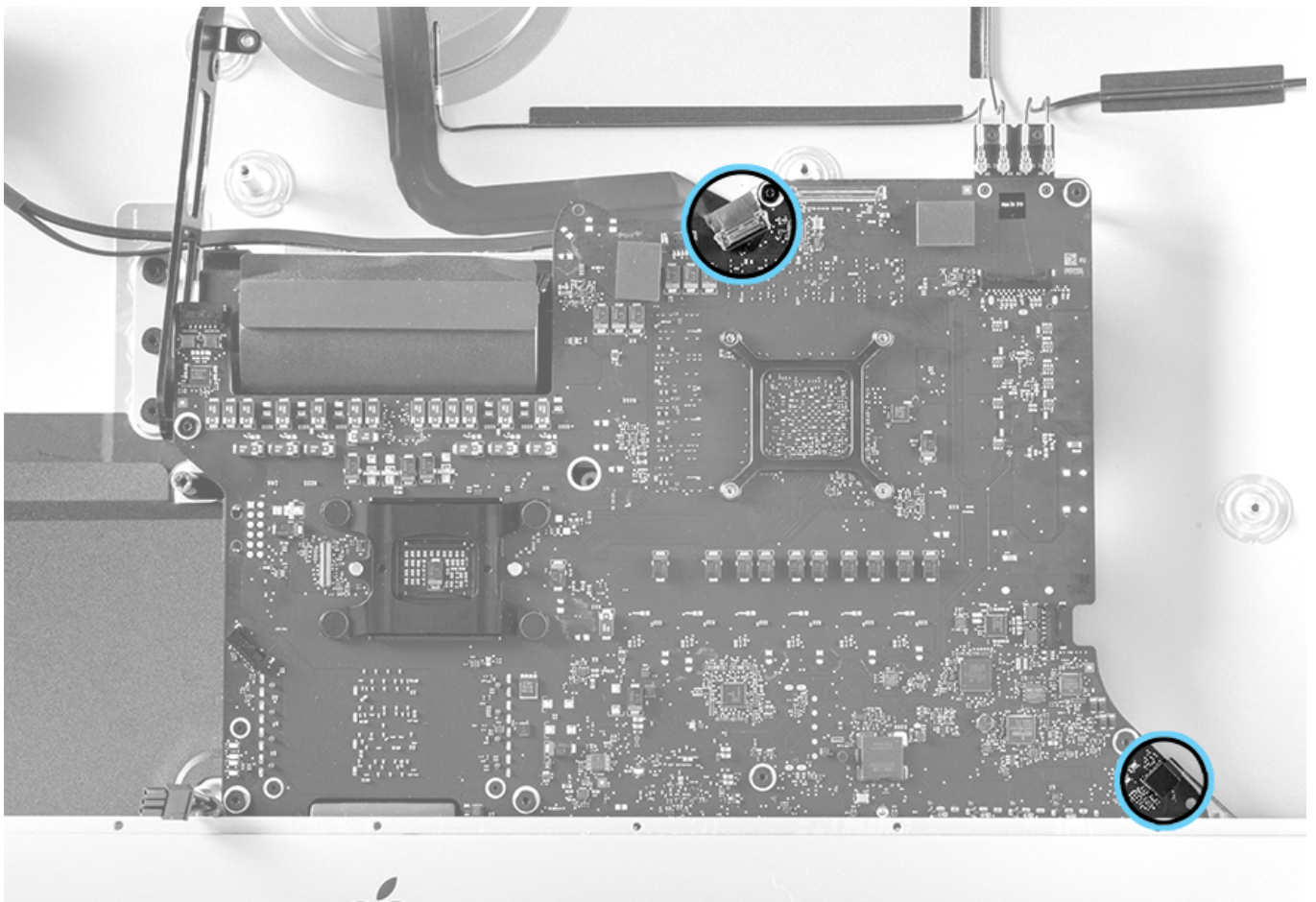
- Black stick
- Thermal pad kit, 076-1445
- Isopropyl alcohol (IPA) wipes



Steps For Removal

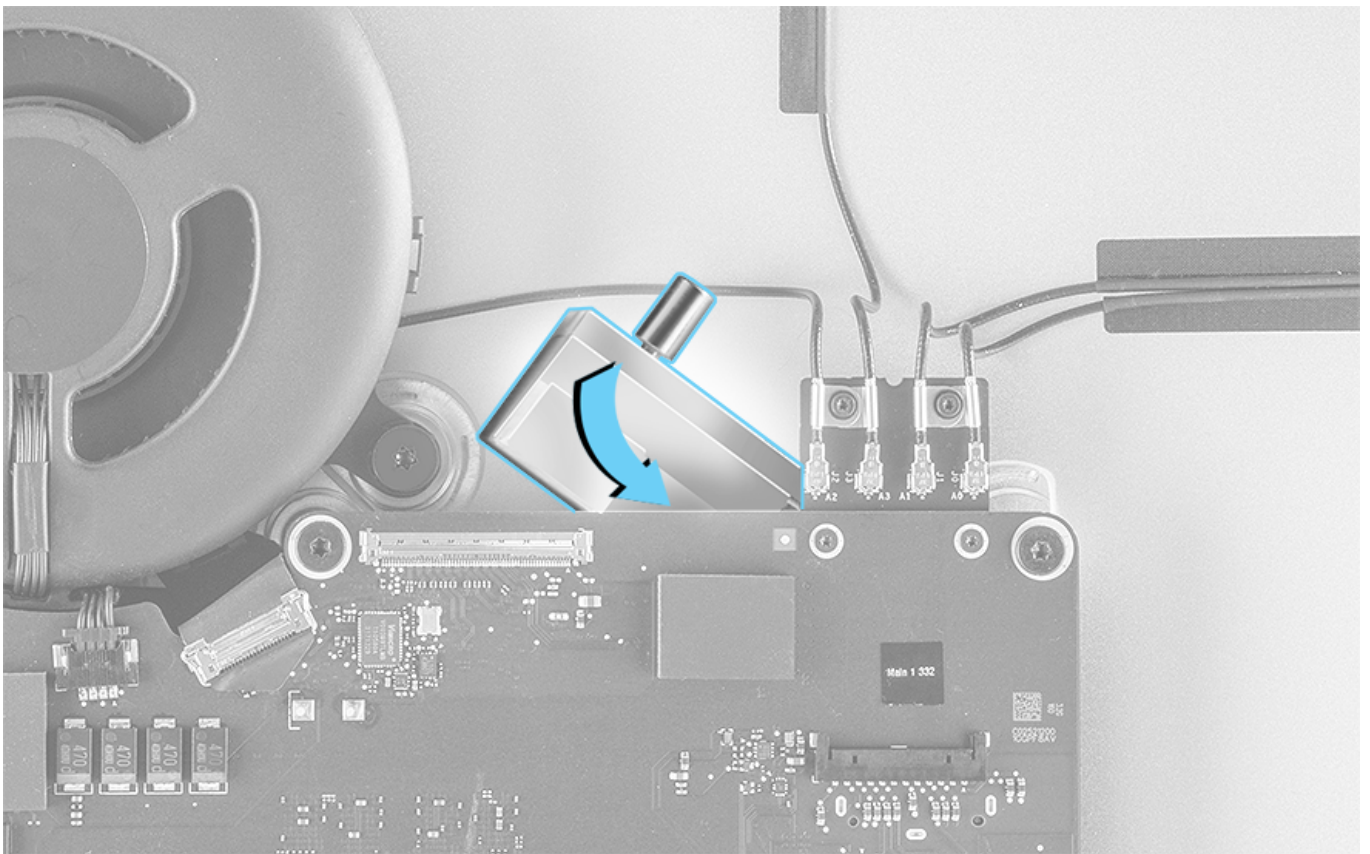
1. Carefully disconnect the following from the logic board:

- Camera/microphone locking-lever bar (top center of the logic board – flip the bar toward the cable)
- Audio connector (lower right corner of the logic board)

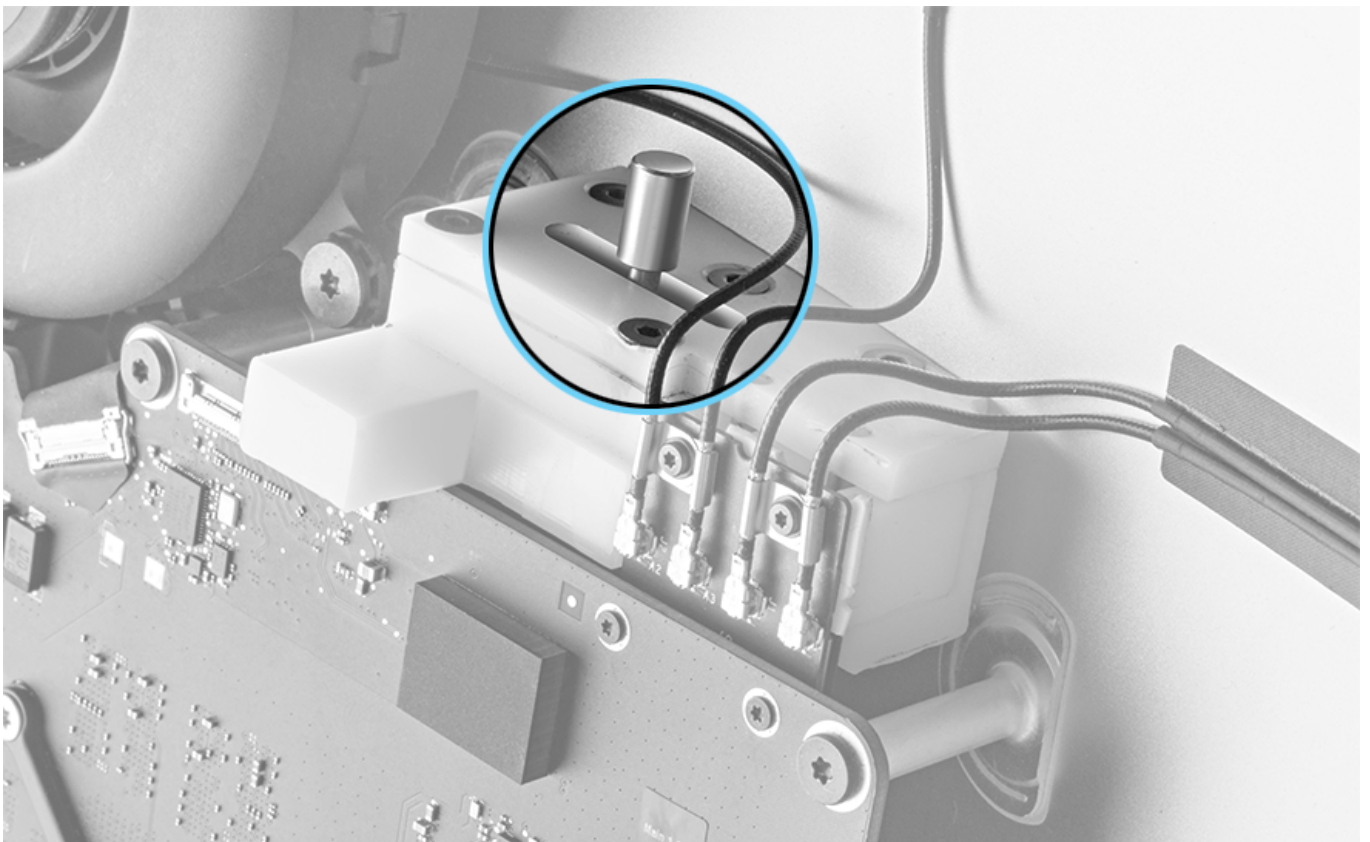


2. To protect the wireless card, slide the wireless card support tool into place between the rear housing and the wireless card.

Note: The lever on top of the wireless card support tool controls the movement of the block within. Keep the lever to the left when inserting or removing the support tool.

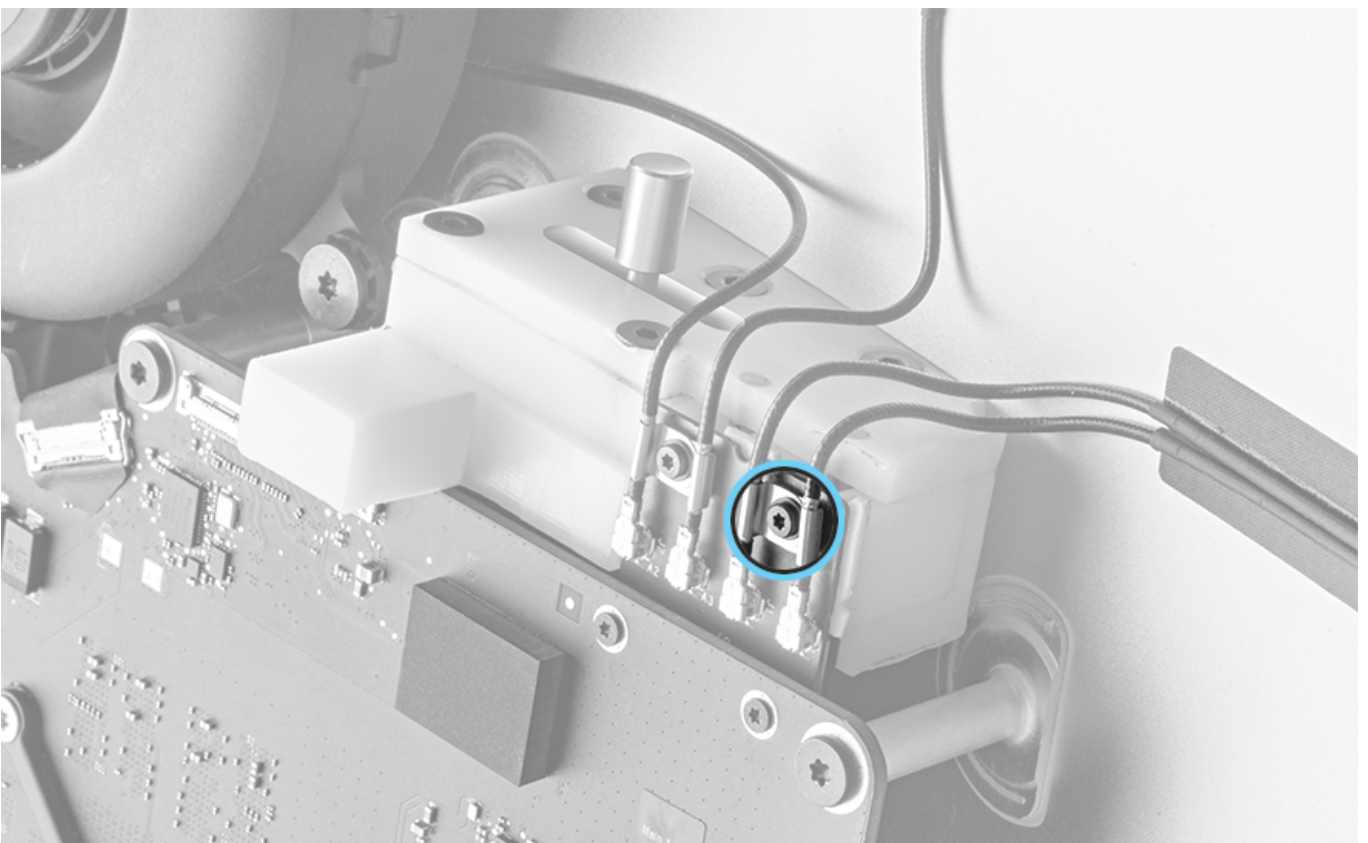
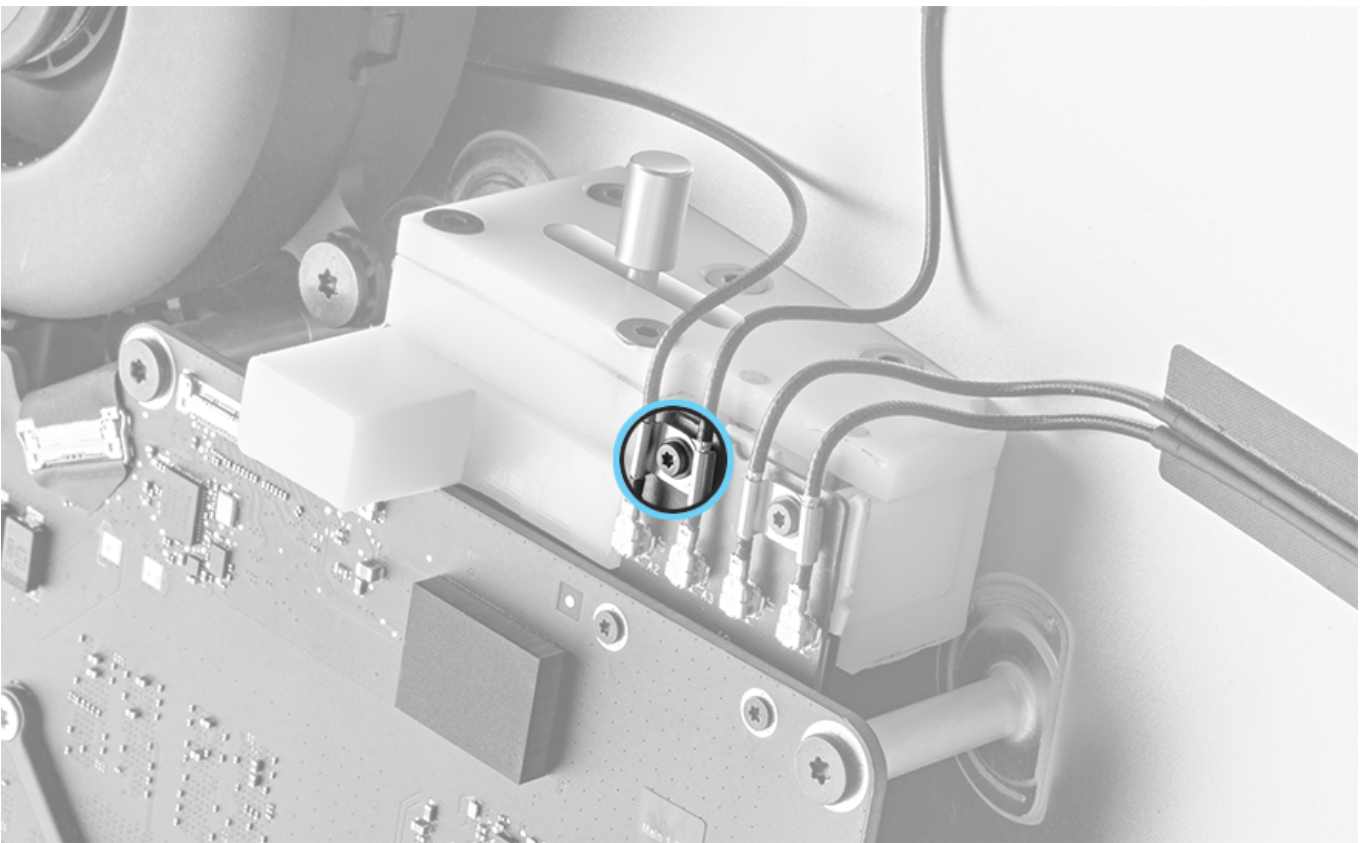


3. Move the lever to the right until the inner block presses against the wireless card. When positioned correctly, the support tool is held firmly in place and cannot be shifted. Keep the support tool in position while removing or replacing screws and when disconnecting or reconnecting antenna cables.



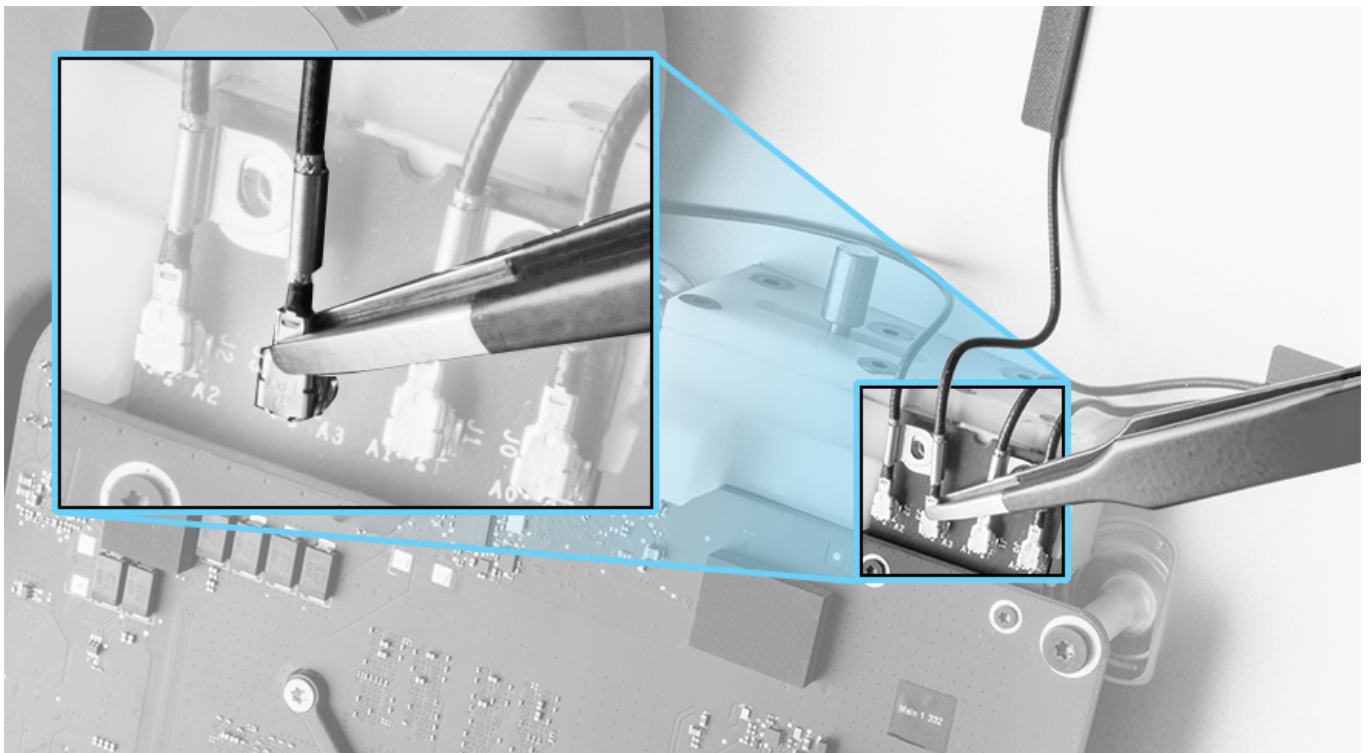
4. Remove two screws from the wireless card.

- T5: (923-00609)



5. Use ESD-safe tweezers to disconnect the antennas from the wireless card.

Caution: When using metal tweezers, be careful not to crimp or damage the antenna.



6. Move the lever on the support tool to the left.

7. Remove the support tool from the rear housing.

8. Remove seven T8 screws, two T10 screws, and one T25 standoff. Completely unscrew one T8 captive screw in the center of the board.

Screw legend:

- S = T8 short screw x 4
 - 923-0331, short



- SS = T10 short shoulder screw x 2
 - 923-0395, short shoulder



- L = T8 long screw x 2
 - 923-0396, 23 mm, long



- L* = T8 long screw x 1
 - 923-00767, 17.80 mm, long



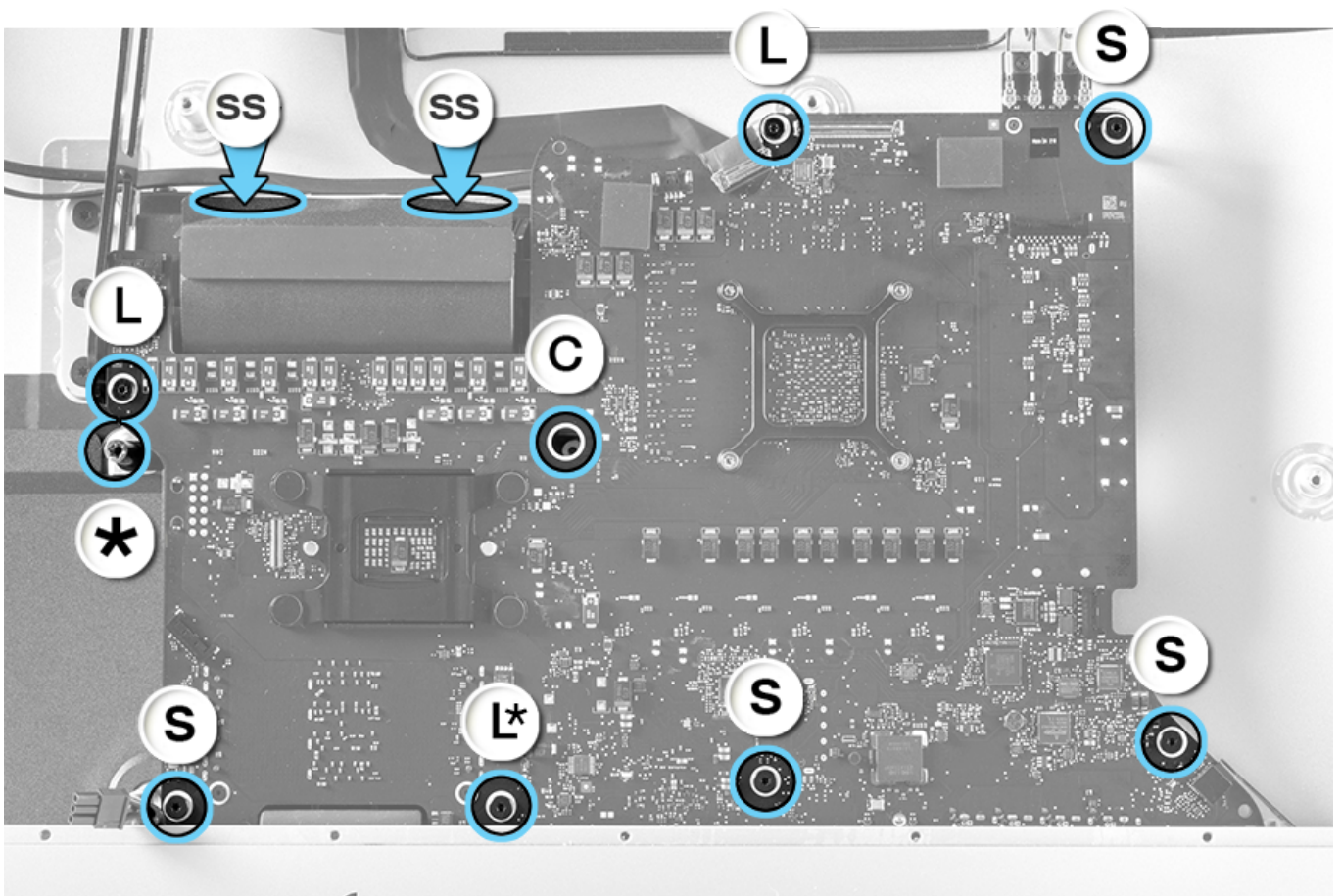
- * = T25 standoff x 1 (black, in Late 2012 model)
 - 923-0373, PSU standoff



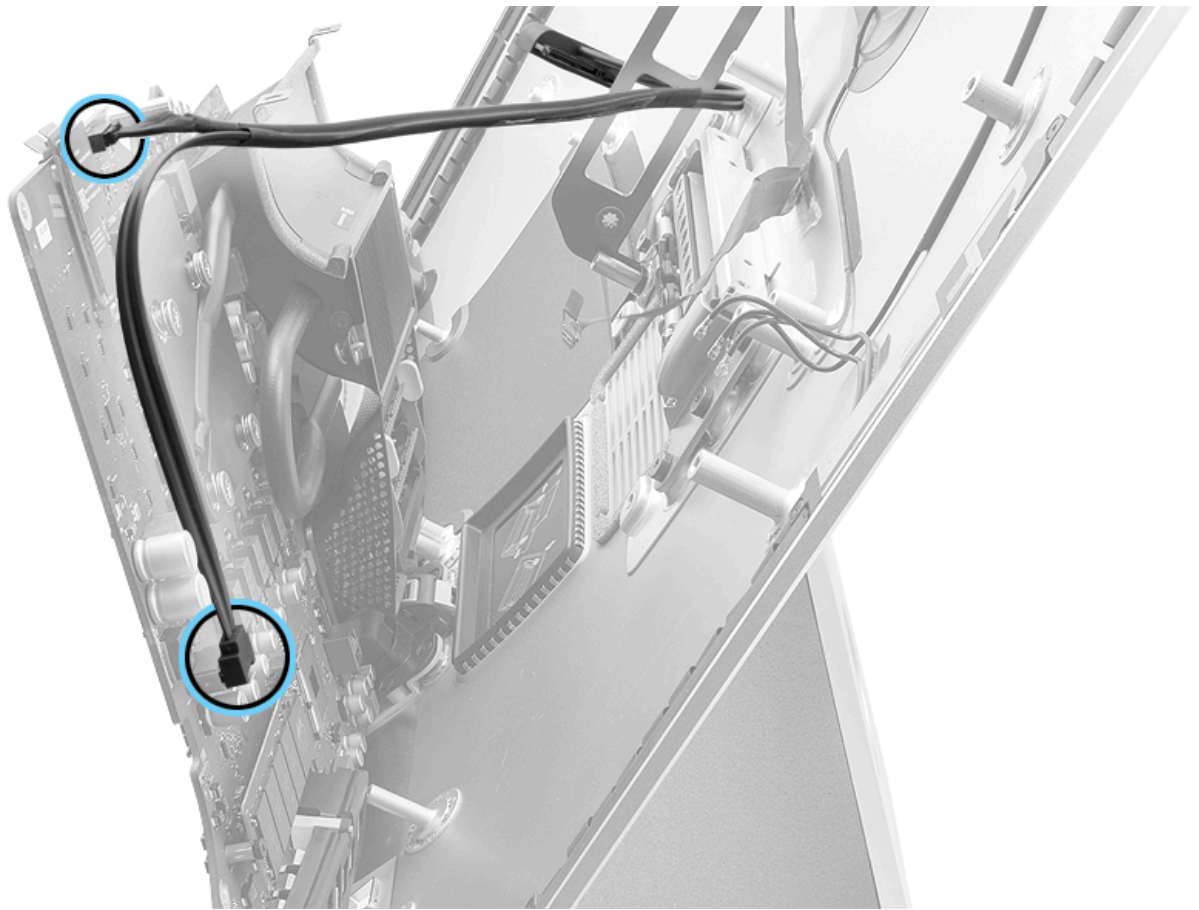
- * = T25 standoff x 1 (with shorter thread)
 - 923-0520, PSU standoff



- C = T8 captive screw x 1 (located in the middle of the board, image not shown)
 - **Note:** The captive screw is not available separately.



9. Carefully tilt the board forward. Disconnect the hard drive data (upper connector) and power cable (lower connector) from the two connectors on the back of the logic board. Pull the data end of the cable toward the rear housing. Pinch the clip on the power cable connector and pull toward the rear housing.



10. With two hands, carefully lift the logic board from the rear housing. **Caution:** Handling the logic board incorrectly can damage chips and circuits. Be extremely careful when removing and replacing the logic board. Components that contact the enclosure, standoffs, or other modules may cause damage and prevent the iMac from operating correctly.

Handling the Logic Board

- Always handle the logic board by its edges.
- Never handle the logic board by the heat sink.

11. Verify that the tamper indicator labels on the heat sink are intact. If labels have been removed or tampered with, then the logic board is not eligible for exchange.

Steps For Reassembly

1. If you are installing a replacement logic board, then transfer these parts from the old logic board:

- hard drive data and power cable
- memory
- power supply signal cable (short black cable that connects to the power supply and logic board)
- wireless card (apply thermal pad before installing)
- flash storage (if present) for Fusion Drive configuration

2. Insert the logic board into the rear housing. **Caution:** Handling the logic board incorrectly can damage chips and circuits. Be extremely careful when removing and replacing the logic board. Components that contact the enclosure, standoffs, or other modules may cause damage and prevent the iMac from operating correctly.

3. Connect the hard drive data and power cable to the back of the logic board.

4. Align the connectors with the ports, place the logic board screws, and partially tighten the screws to keep them in place – **but do not fully tighten the screws at this point.**

Screw legend:

- S = T8 short screw x 4
 - 923-0331, short



- SS = T10 short shoulder screw x 2
 - 923-0395, short shoulder



- L = T8 long screw x 2
 - 923-0396, 23 mm, long



- L* = T8 long screw x 1
 - 923-00767, 17.80 mm, long



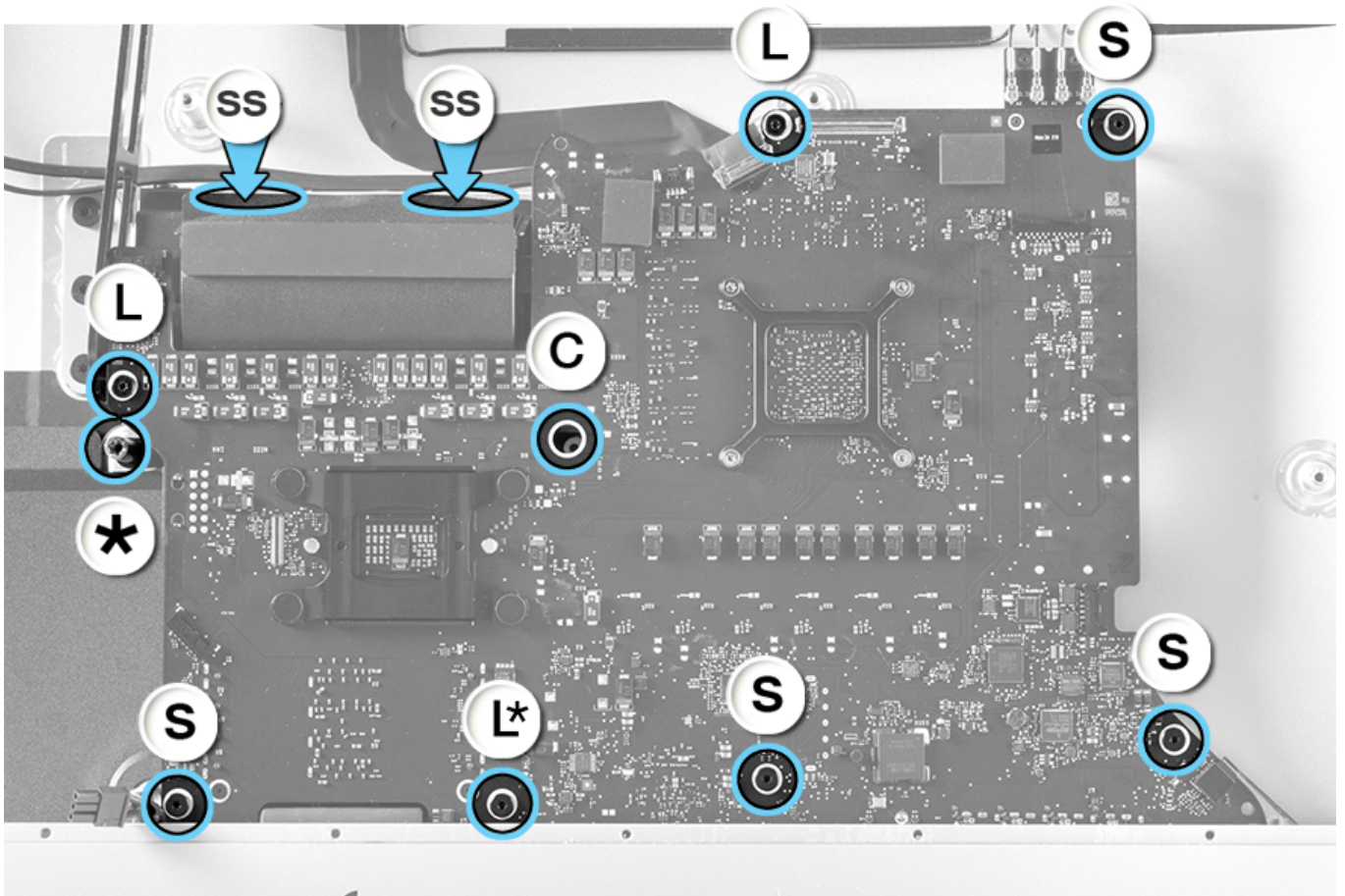
- * = T25 standoff x 1 (black, in Late 2012)
 - 923-0373, PSU standoff



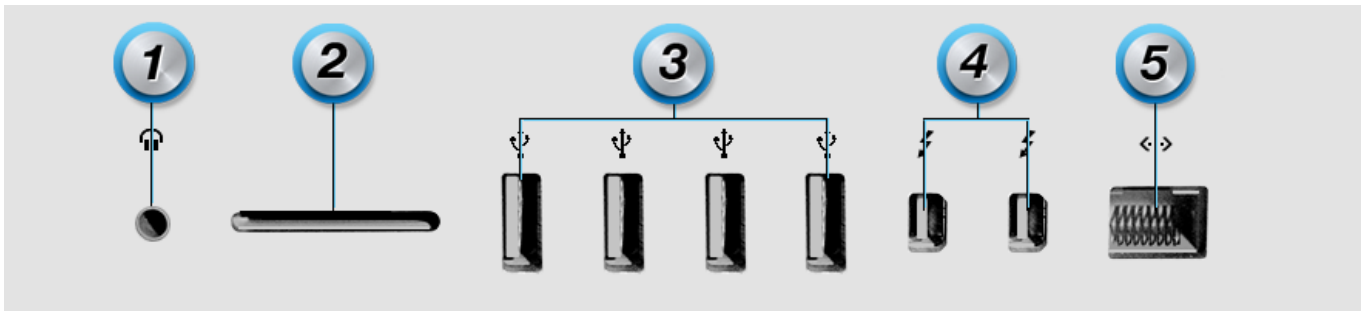
- * = T25 standoff x 1 (with shorter thread)
 - 923-0520, PSU standoff



- C = T8 captive screw x 1 (located in the middle of the board, image not shown)
 - **Note:** The captive screw is not available separately.



6. To ensure correct logic board alignment with the rear housing, plug in one USB cable (#3) and two Thunderbolt cables (#4) while tightening the logic board screws.

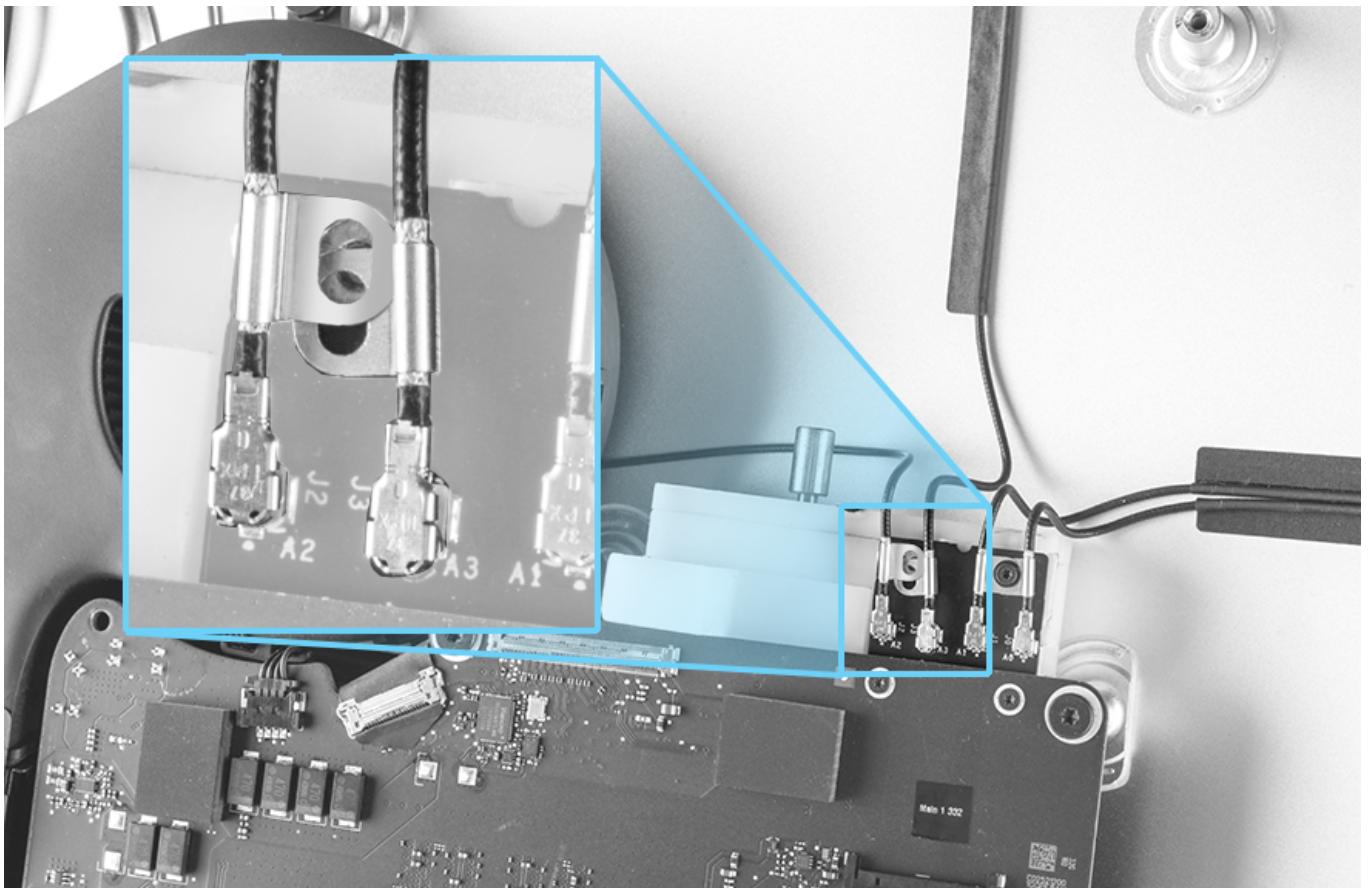


7. Connect the camera/microphone cable and the audio cable.

8. To protect the wireless card, slide the wireless card support tool into place between the rear housing and the wireless card. Reconnect the antennas to the wireless card using ESD-safe tweezers.

9. Reinstall the screws and brackets to the wireless card. The brackets are placed left over right.

- T5: (923-00609)



10. Use ESD-safe tweezers to reconnect the antennas to the wireless card.

Caution: When using metal tweezers, be careful not to crimp or damage the antenna.

11. Move the lever on the support tool to the left.

12. Remove the support tool from the rear housing.

13. Reinstall the [power supply](#).

14. Reinstall the [hard drive](#).

15. Reinstall the [left speaker](#).

16. Reinstall the [right speaker](#).

17. Reinstall the [chin strap](#).

18. Reinstall the [fan](#).

19. Install new [display panel VHB strips](#).

20. Reinstall the [display panel](#).

If you have installed a replacement logic board:

21. Apply a new Ethernet ID label (included in box with new logic board) to the bottom of the stand.

22. Use Blank Board Serializer (BBS) to set the computer's serial number after the computer has been reassembled. BBS can be run from AST 2 or as a standalone, USB-based version found in article [SD63: Blank Board Serializer](#).

- For more information about AST 2 and supported Mac models, see article [OP476: Latest Apple Service Toolkit download links and documentation](#).
- **Important:** When using BBS in AST 2, ensure that the unit under test (UUT) and the AST server are connected to the same network, and that the AST server has the latest software version installed.

Flash Storage

First Steps

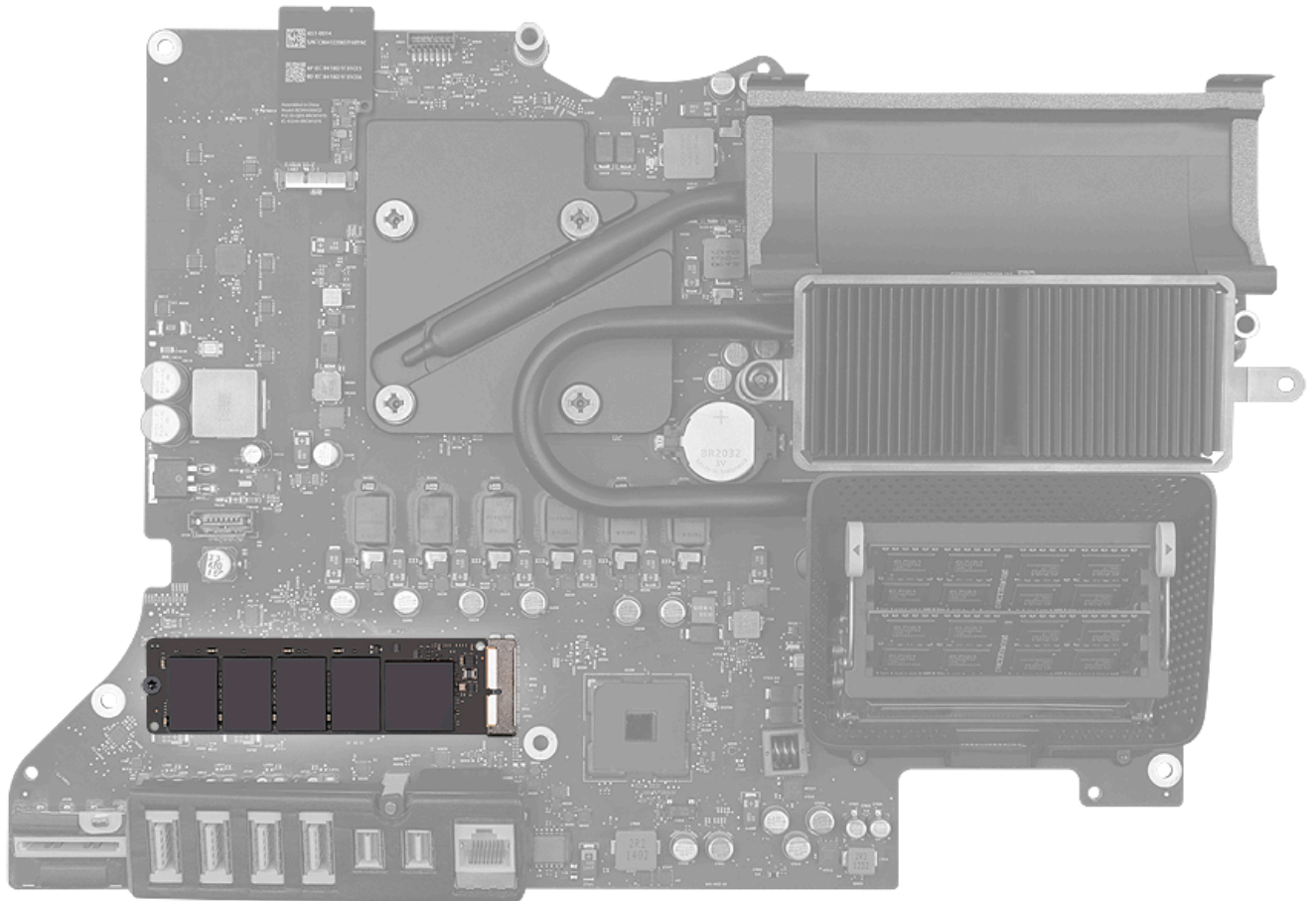
Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: About AppleCare service certifications](#).

For video instruction, refer to article [SV248: Flash Storage Replacement Video](#).

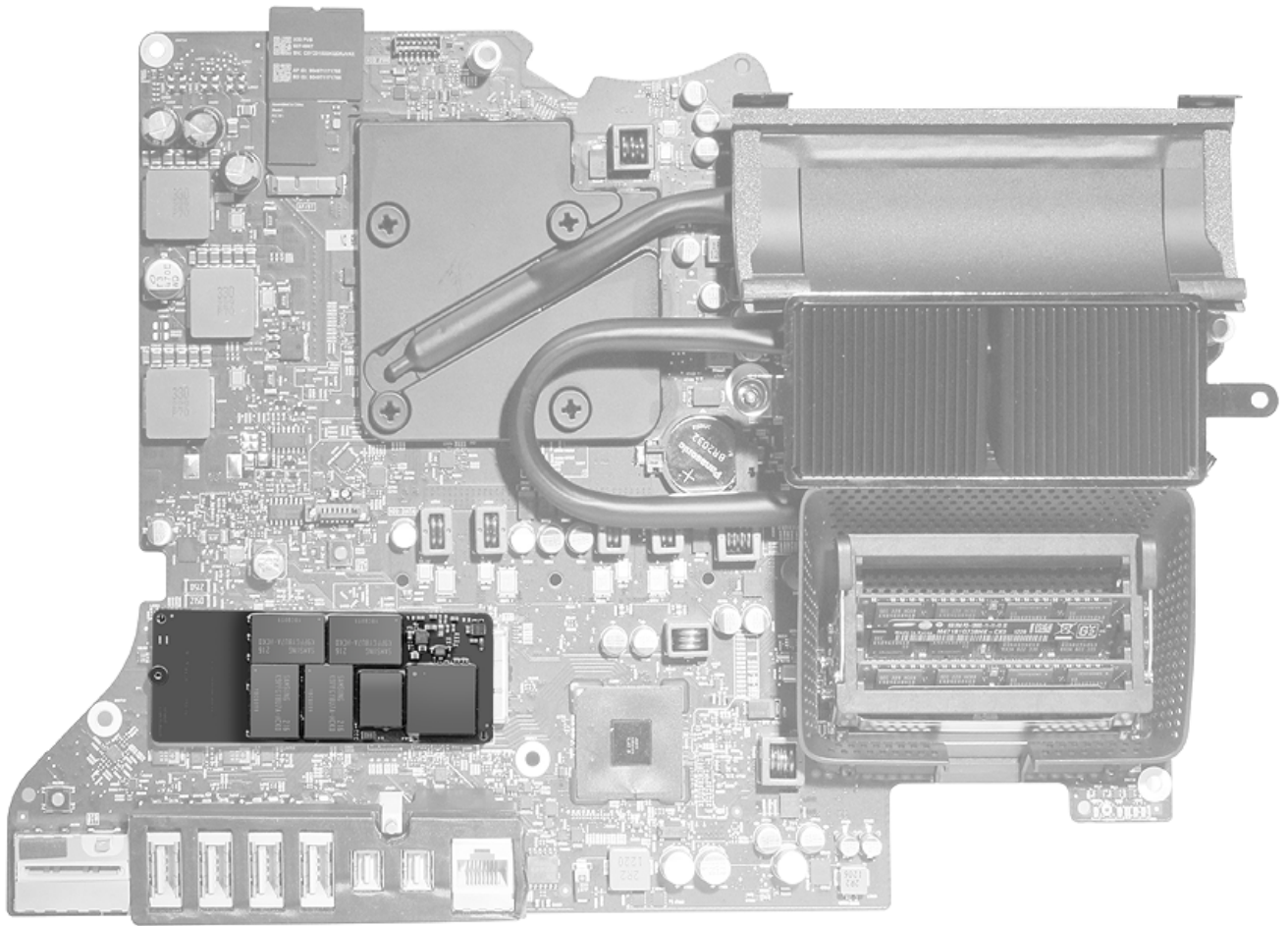
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)

iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

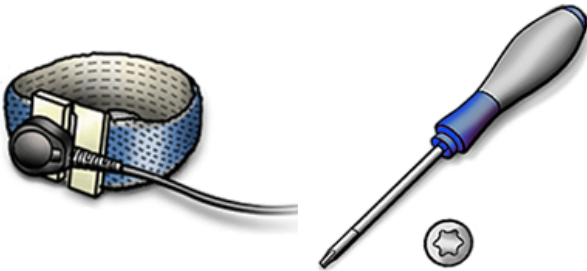


iMac (27-inch, Late 2012 and Late 2013)



Tools

- ESD wrist strap and mat
- Torx T8 screwdriver (magnetized)



Steps For Removal

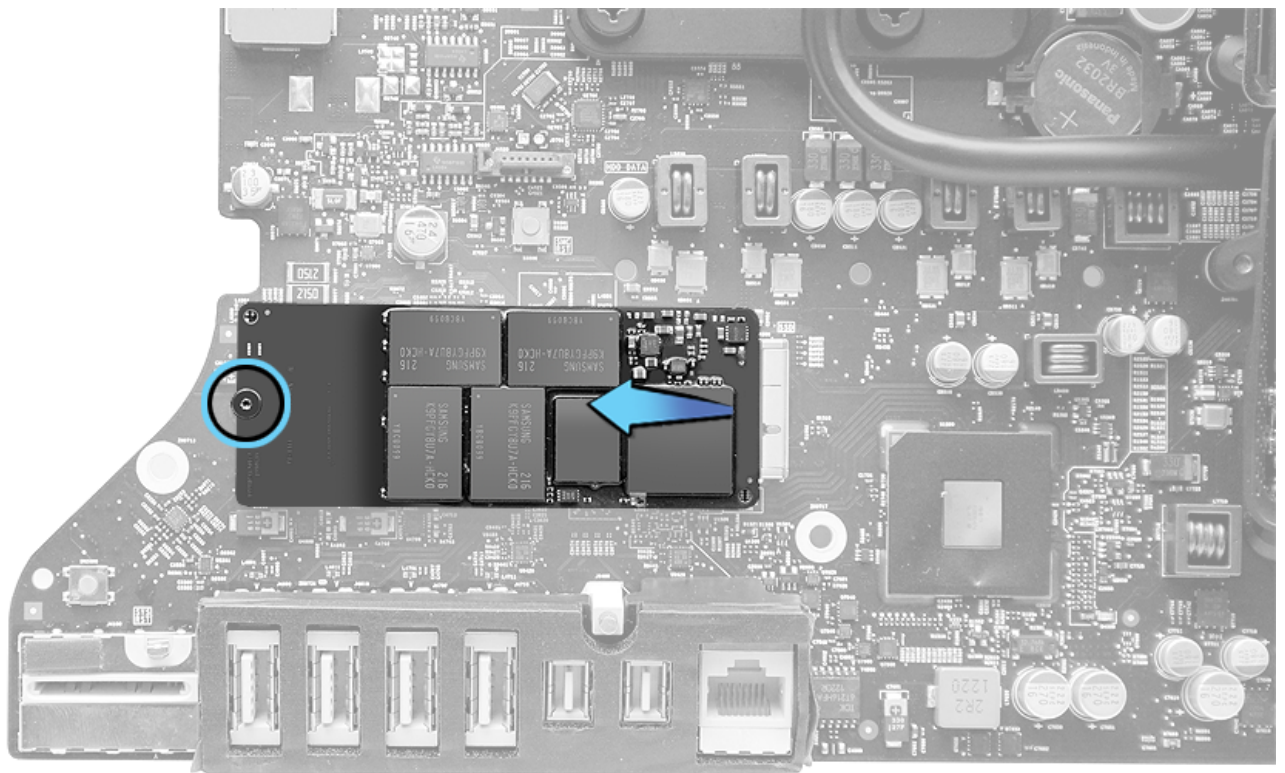
Caution: Check that data is backed up before removing the SSD card or flash storage.

1. Remove one T8 screw from the SSD card or flash storage.

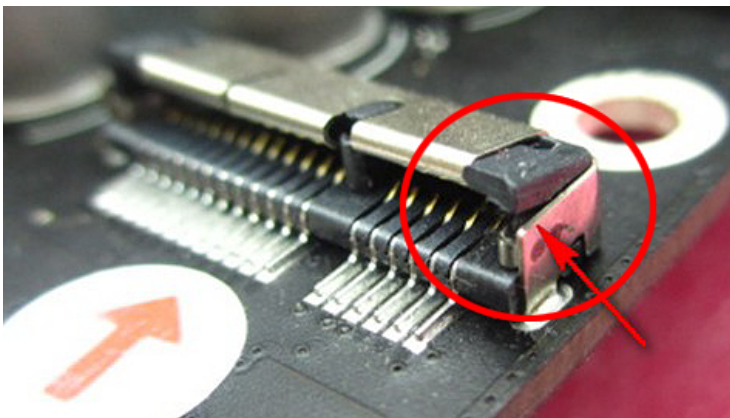
- 923-0328 or 923-0336 for Late 2015



2. **Gently** pull the flash storage straight out of the connector. **Caution:** Do not lift the flash storage at an angle when removing it from the connector. Lifting the the flash storage at an angle can damage the connector on the logic board and warrant a logic board replacement.

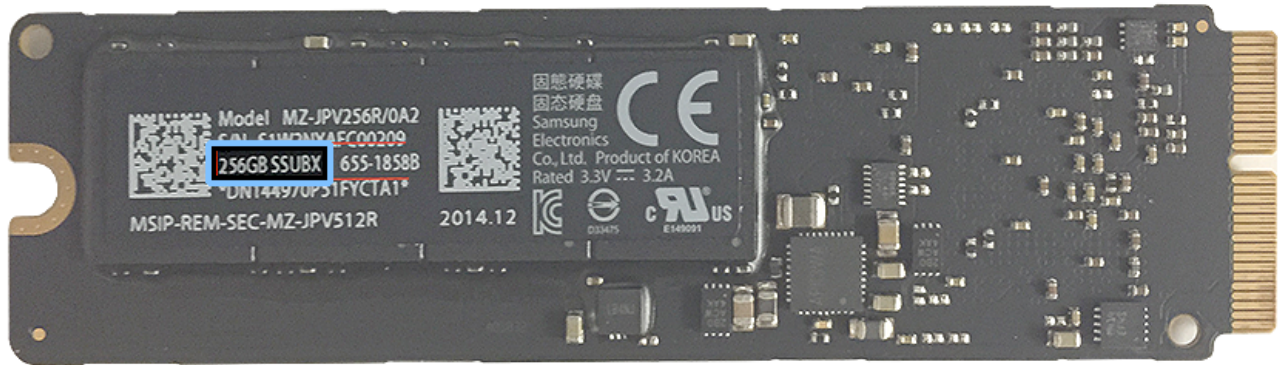
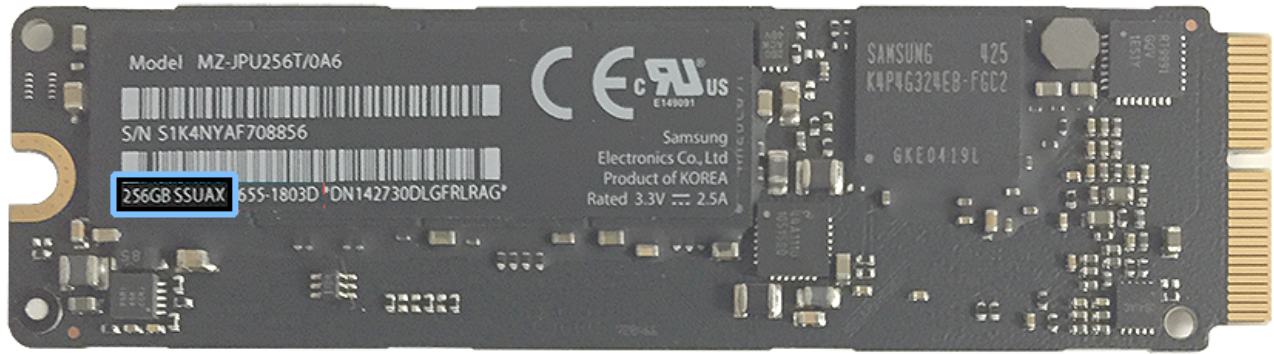


A wireless card connector shows the damage caused by lifting the wireless card at an angle during removal.



Steps For Reassembly

1. Replace the flash storage module like-for-like. For example, if the computer uses the SSUAX flash storage, replace it with another SSUAX flash storage module. To identify which flash storage module you have, refer to the images below. The SSUAX module is the upper image and the SSUBX module is the lower image.



2. Before installing a replacement card in the computer, remove any compliance label found on the underside of the module.



3. Insert the SSD card or flash storage straight into the logic board connector. **Caution:** Do not lift the flash storage at an angle when inserting it into the connector. Lifting the flash storage at an angle can damage the flash storage connector on the logic board and warrant a logic board replacement.

4. Install one T8 screw to the SSD card or flash storage.

5. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.

6. Reinstall the [power supply](#).

7. Reinstall the [hard drive](#).

8. Reinstall the [left speaker](#).

9. Reinstall the [right speaker](#).

10. Reinstall the [chin strap](#).

11. Reinstall the [fan](#).

12. Install new [display panel VHB strips](#).
13. Reinstall the [display panel](#).
14. Refer to article [TP767: Reinstalling Software That Came with the Computer](#).
15. **Note:** For the iMac (Retina 5K, Late 2015) model, reset the NVRAM after replacing the flash storage module. Refer to article [HT204063: How to reset NVRAM on your Mac](#).

Reinstalling Software That Came with the Computer

Reinstalling Software That Came with the Computer

This procedure requires an Internet connection.

Note: In some situations, a user may have set a firmware password via a feature such as Find My Mac or FileVault. The user must know the firmware password in order to reinstall OS X or macOS. If the user cannot remember the password, then refer to the technician instructions in article [HT203409: If you lost or forgot your firmware password](#).

Important: Apple recommends that users back up their data before any software restore procedure. Back up essential files before installing OS X or macOS. Apple is not responsible for any loss of data.

1. Choose Apple menu > Restart, then hold down the Command (⌘) and R keys while the computer restarts.
Note: To force OS X Lion or later, or macOS Sierra, into Internet Recovery, press and hold the Command-Option-R key combination while starting up the computer.
2. If the computer is not connected to the Internet, choose a network from the Wi-Fi menu (in the top-right corner of the screen).
3. Select "Reinstall OS X" (or macOS), then click Continue.
4. Follow the onscreen instructions. In the pane where you select a disk, select your current OS X or macOS disk (in most cases, it is the only one available).
5. To start the installation, click Install.

Check for and apply the latest software and firmware updates.

For more information, refer to article [HT201314: About macOS Recovery](#).

Wireless Card

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

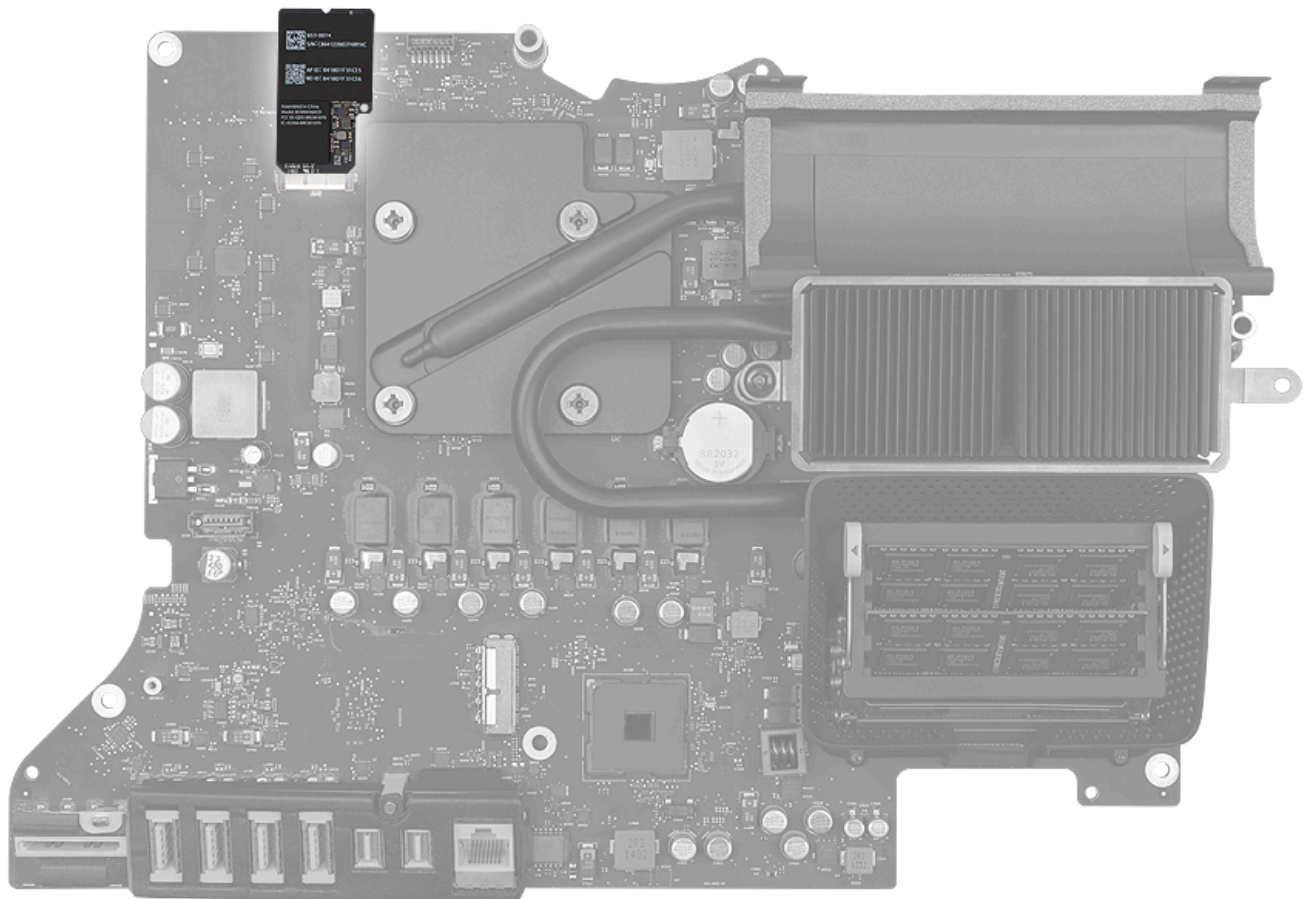
For video instruction, refer to article [SV249: Wireless Card Replacement Video](#).

Remove:

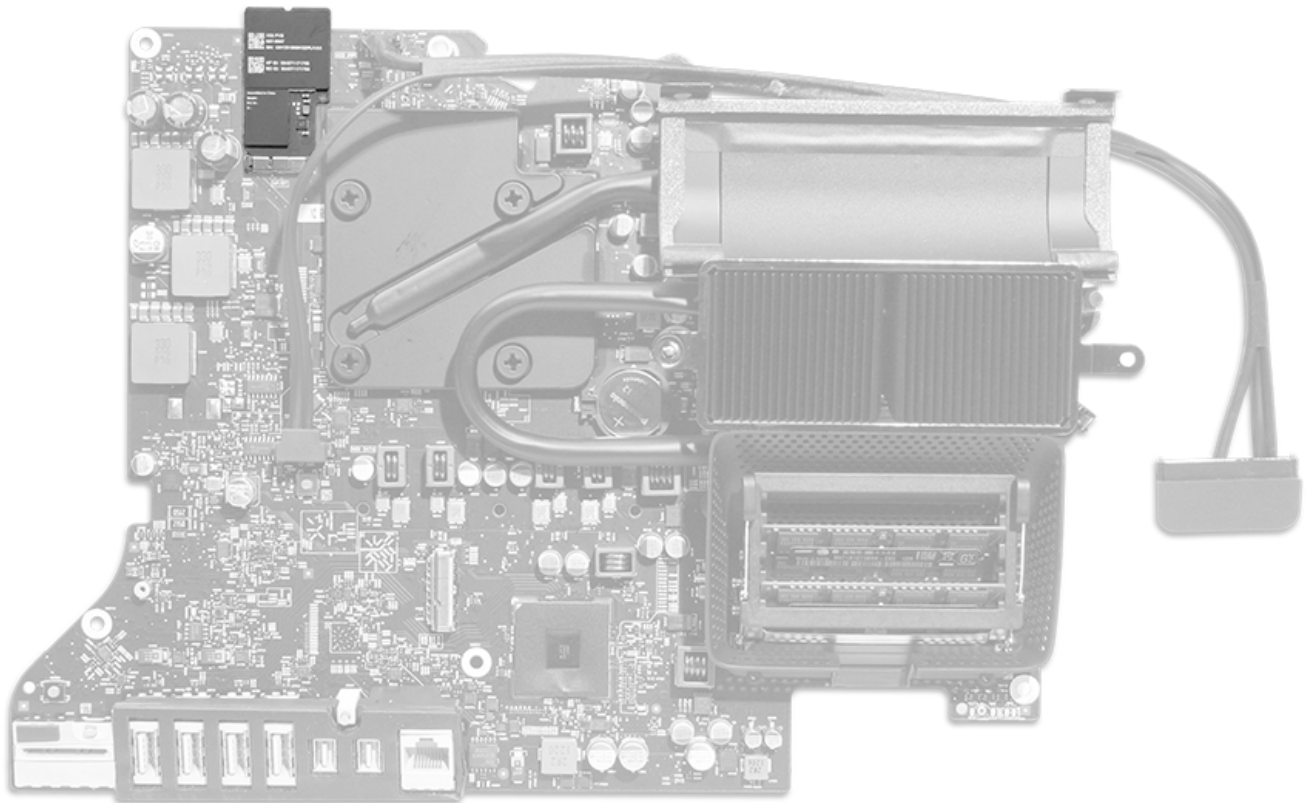
- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#)

Caution: Do not remove the wireless card without taking out the logic board. Attempting to do this is likely to damage both the wireless card and the logic board. Additionally, the use of thermal material during installation will make it difficult to insert the card if the logic board has not been removed.

iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)



iMac (27-inch, Late 2012 and Late 2013)

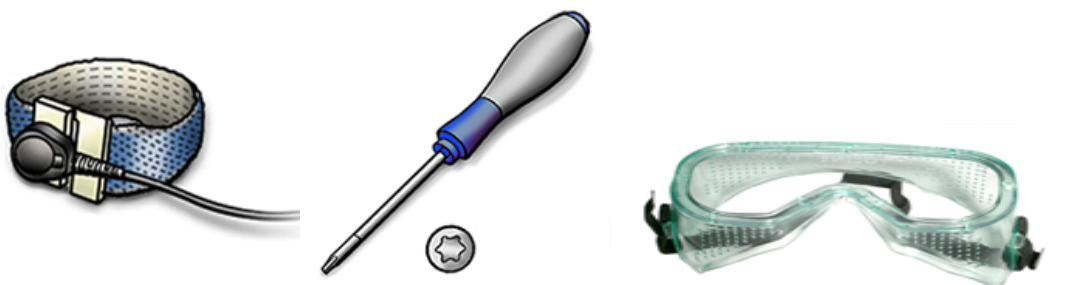


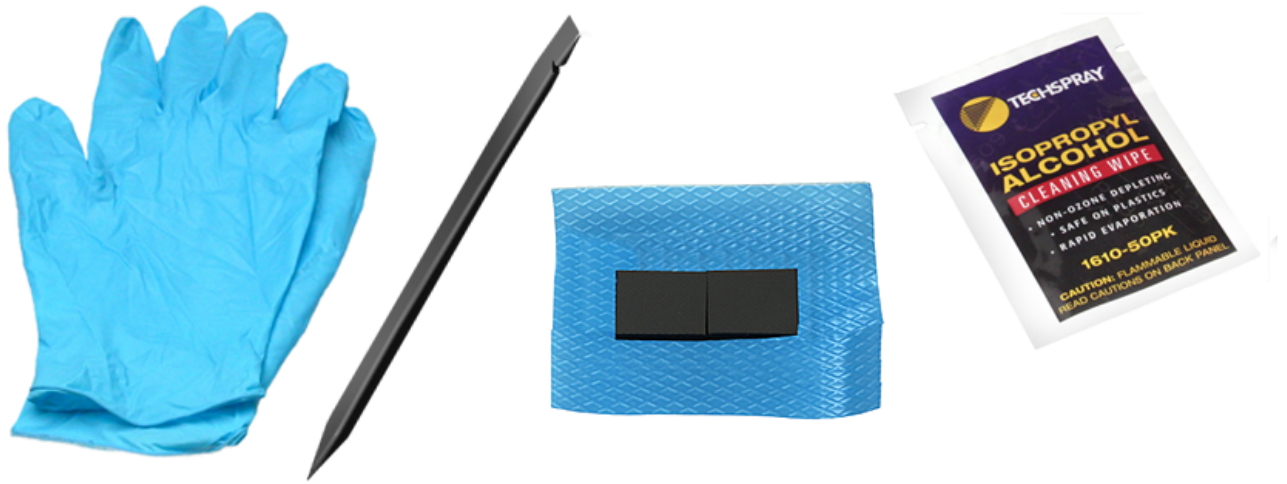
Tools

- ESD wrist strap
- Torx T5 screwdriver (magnetized)
- Black stick
- Thermal pad kit, 076-1445 (replaces twinpak thermal material)
- Isopropyl alcohol (IPA) wipes
- Nitrile gloves (use when cleaning twinpak thermal material)
- Safety glasses (use when cleaning twinpak thermal material)
- Service wedge (iMac)

Note: On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012 and Early 2013) models. The thermal pad kit is included with replacement wireless card and logic board parts on the iMac (Late 2012 and Early 2013) models. On the iMac (Late 2013 and later) models, the thermal pad is **only** included with the wireless card. The kit is also available separately (076-1445).

Whenever you remove or replace the wireless card in an iMac (Late 2012 and Early 2013) model, check for original thermal material. If it is present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.



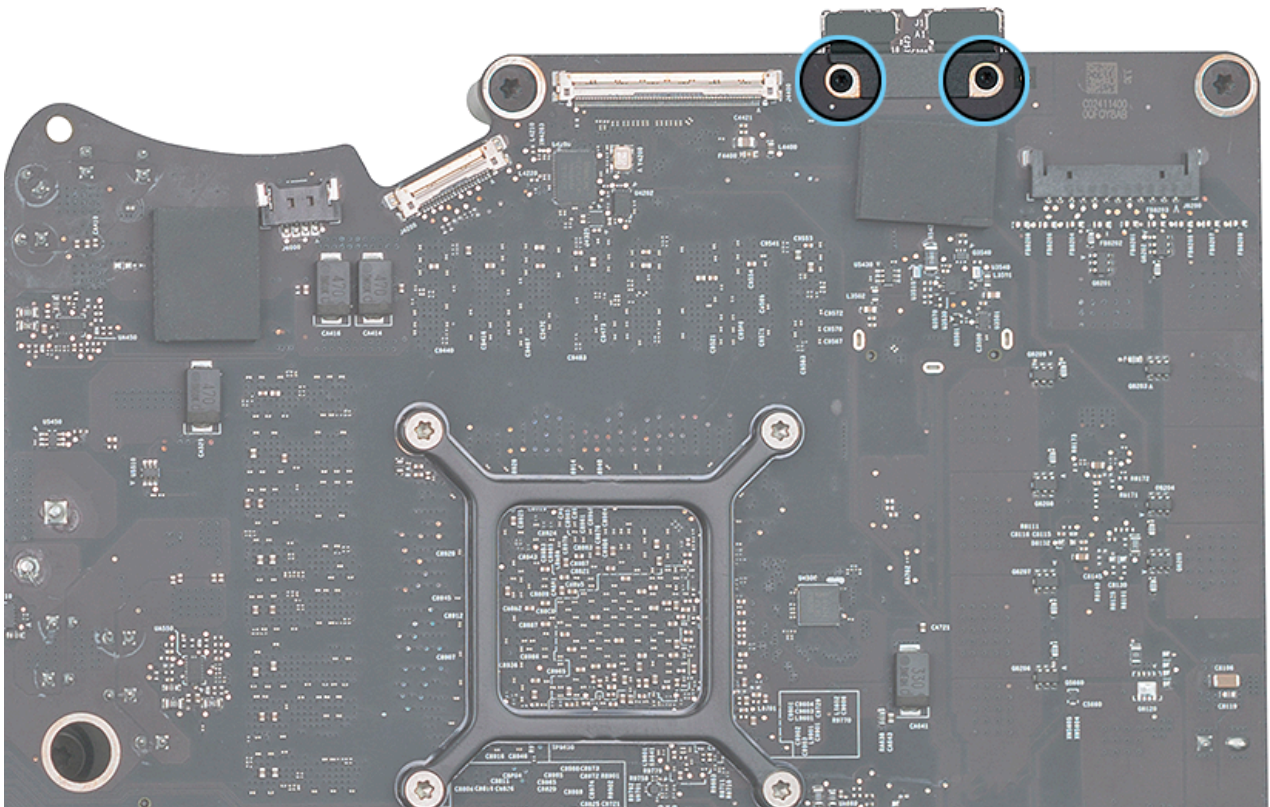


Steps For Removal

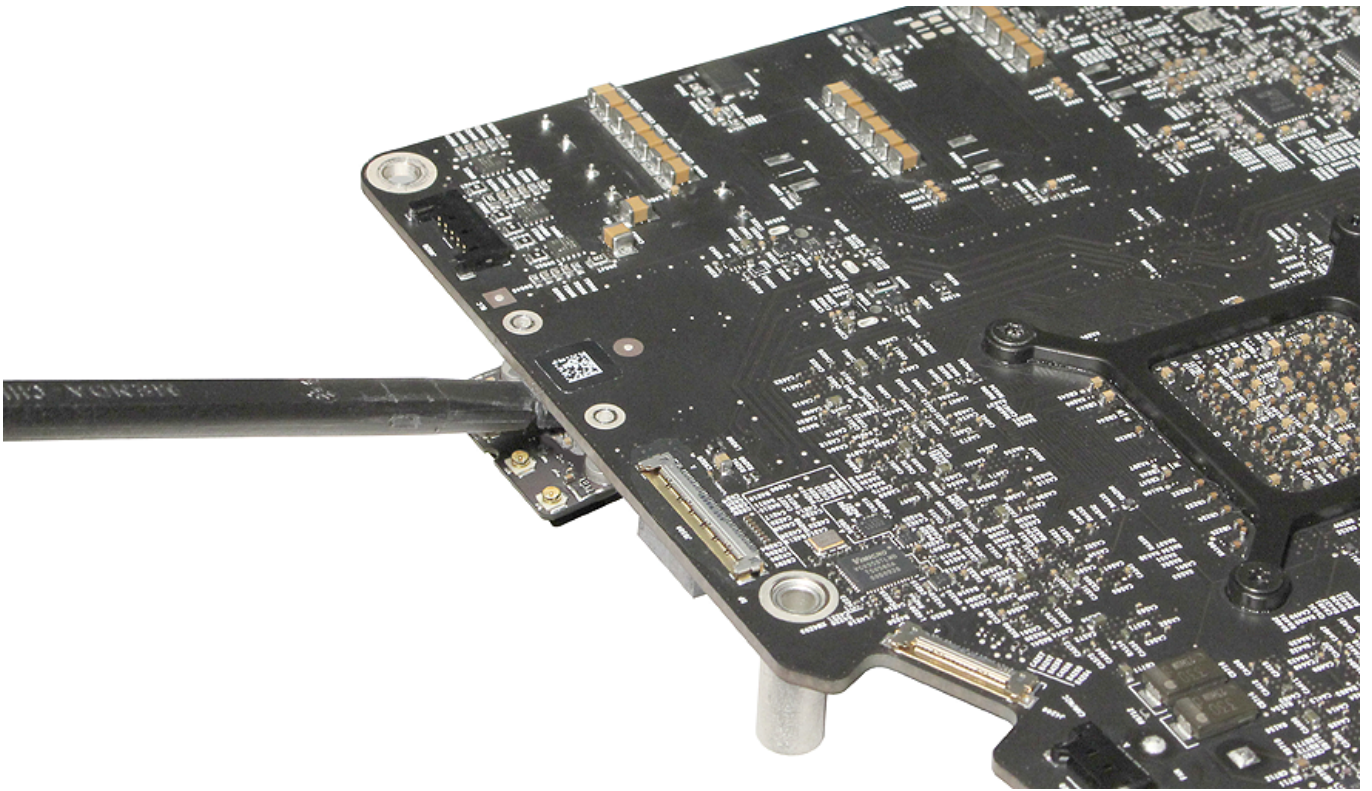
1. Remove two T5 screws from the wireless card.

- 923-0394 (3 mm)

Note: iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) uses Mylar tape to secure the antennas to the antenna connectors.

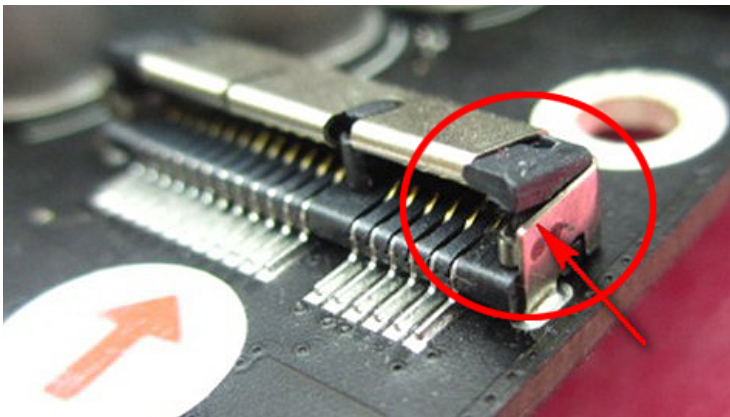


2. Use a black stick to gently loosen the bond of thermal material between the logic board and wireless card. **Important:** Exerting too much force when trying to loosen the bond of the thermal material could damage the wireless card connector (see the damaged connector in step 3).

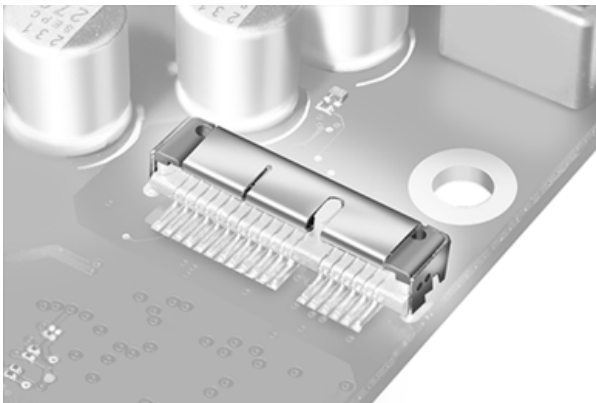


3. **Important:** A damaged wireless card connector requires a logic board replacement. **Note:** Damaged iMac (21.5-inch, Late 2012) wireless connector shown.

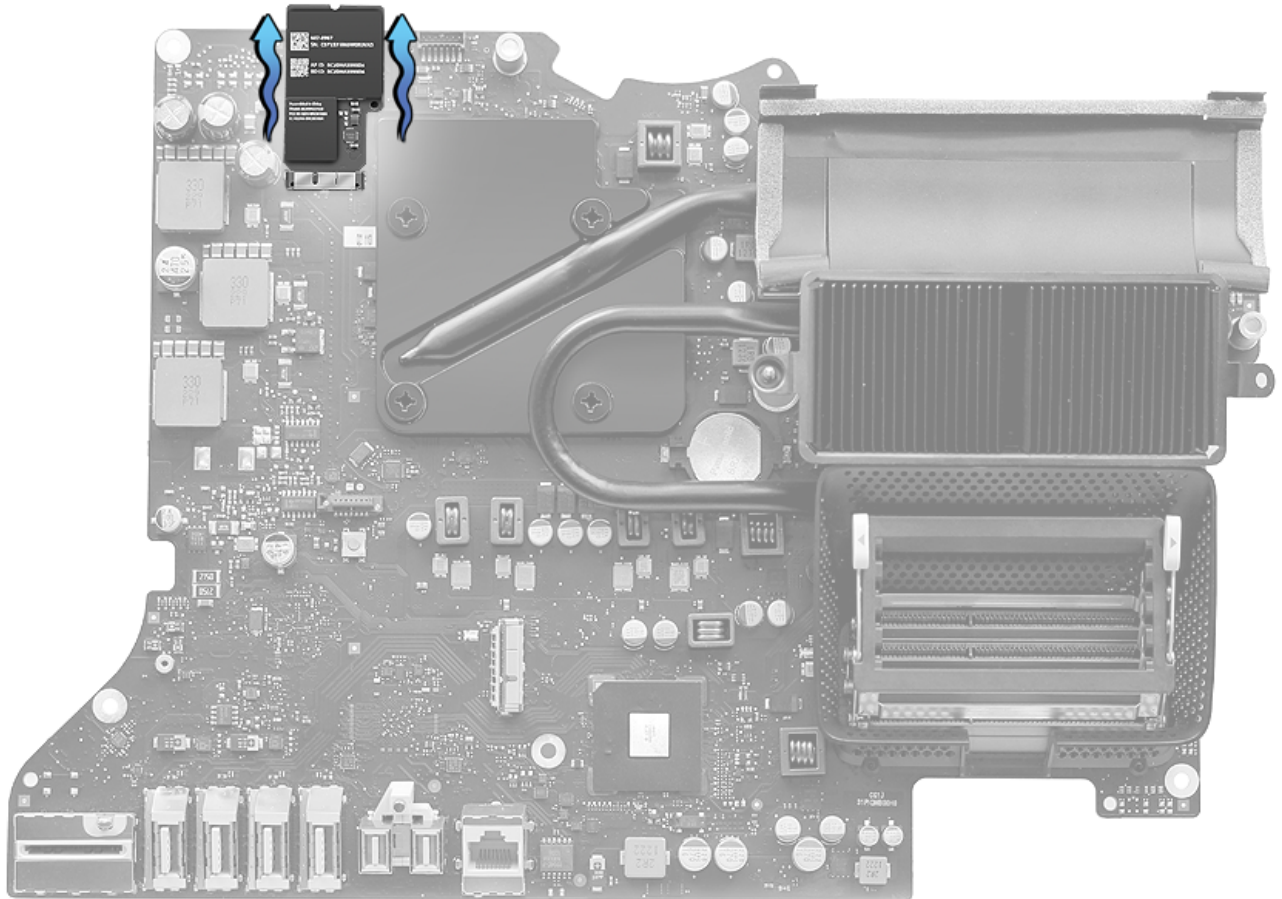
Damaged Wireless Card Connector



Wireless Card Connector With No Damage

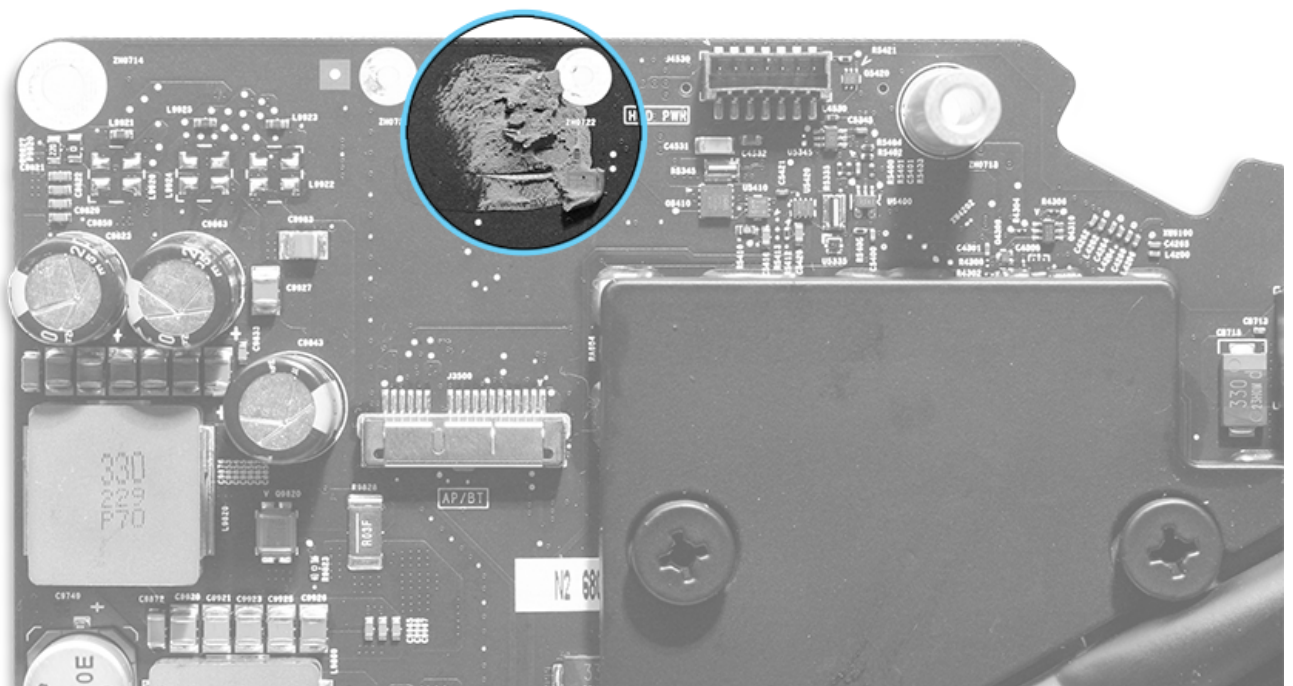


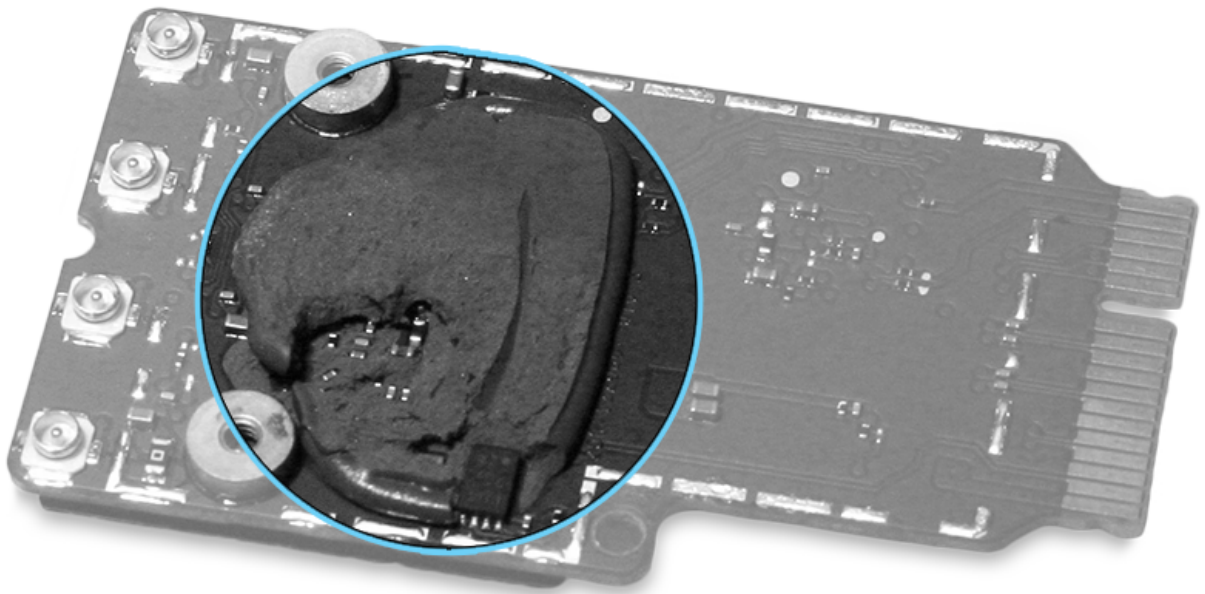
4. Gently wiggle the wireless card straight up and out of the wireless card connector.



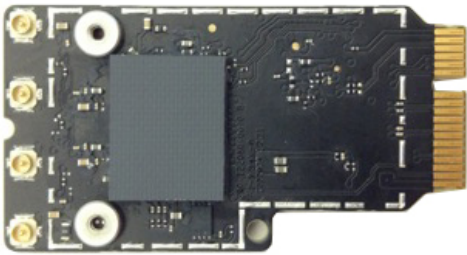
5. If thermal material is present, use a black stick to carefully remove the thermal material from both the logic board and wireless card. Clean both modules with IPA wipes.

- **Logic board and wireless card with thermal material**





- Wireless card with thermal pad

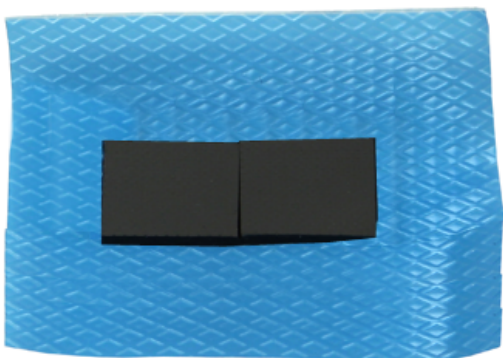


Steps For Reassembly

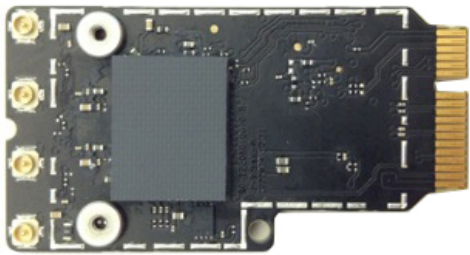
1. On July 17, 2013, a thermal pad kit replaced the original twinspace of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012 and Early 2013) models. The thermal pad kit is included with wireless card and logic board replacement parts on the iMac (Late 2012 and Early 2013) models, and is available separately (076-1445). On the iMac (Late 2013 and later) models, the thermal pad is **only** included with the wireless card.

Whenever you remove or replace the wireless card in an iMac (Late 2012 and Early 2013), check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.

Thermal pads

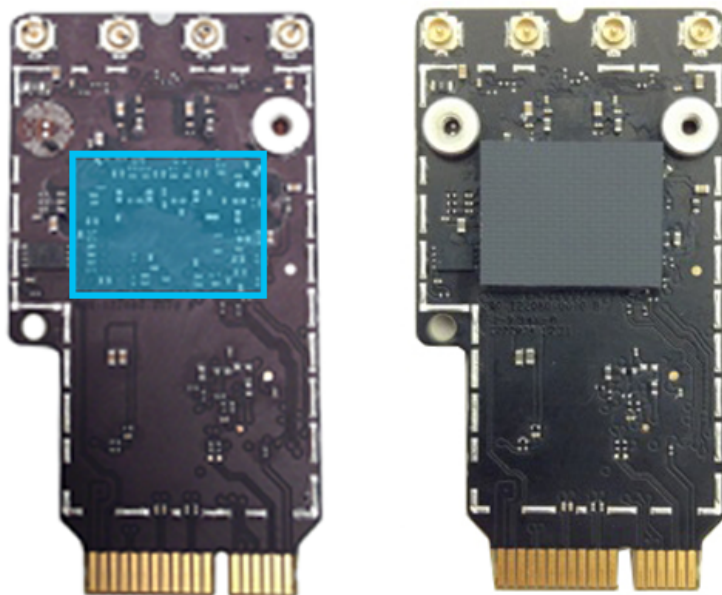


2. If the card has a thermal pad installed, check the condition of the thermal pad. Transfer the thermal pad to the replacement wireless card (unless it no longer adheres properly or is damaged).

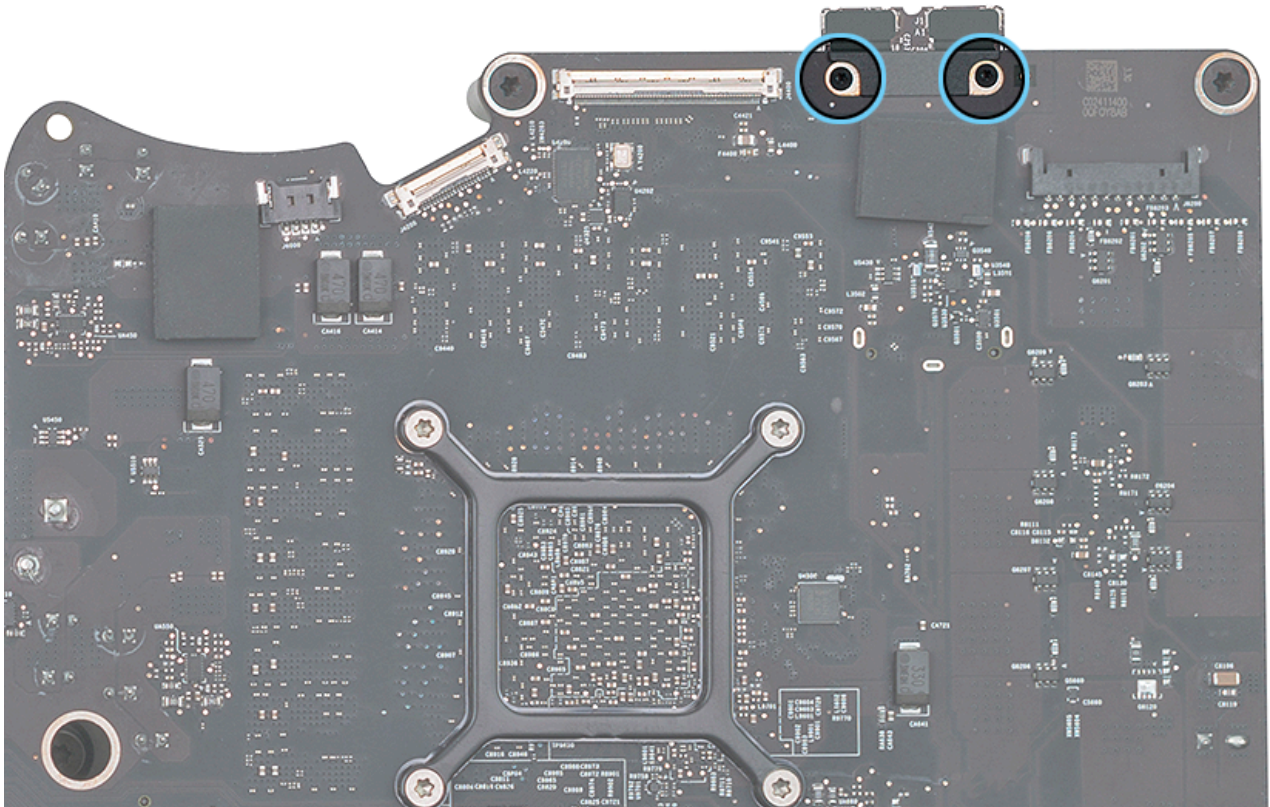


3. If the wireless card needs a thermal pad, attach one new thermal pad to the area indicated.

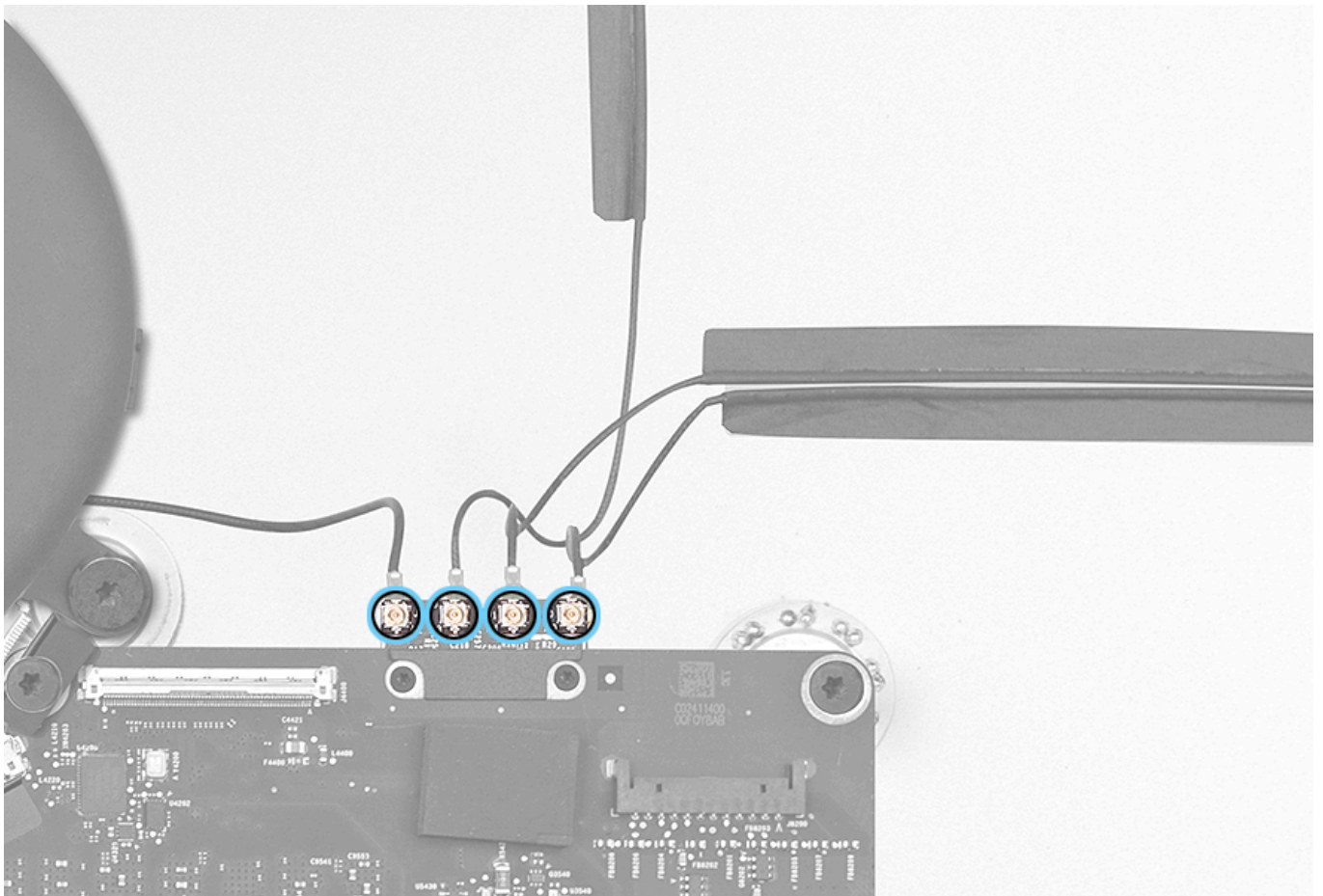
4. Align the wireless card and slide it into the connector on the logic board.



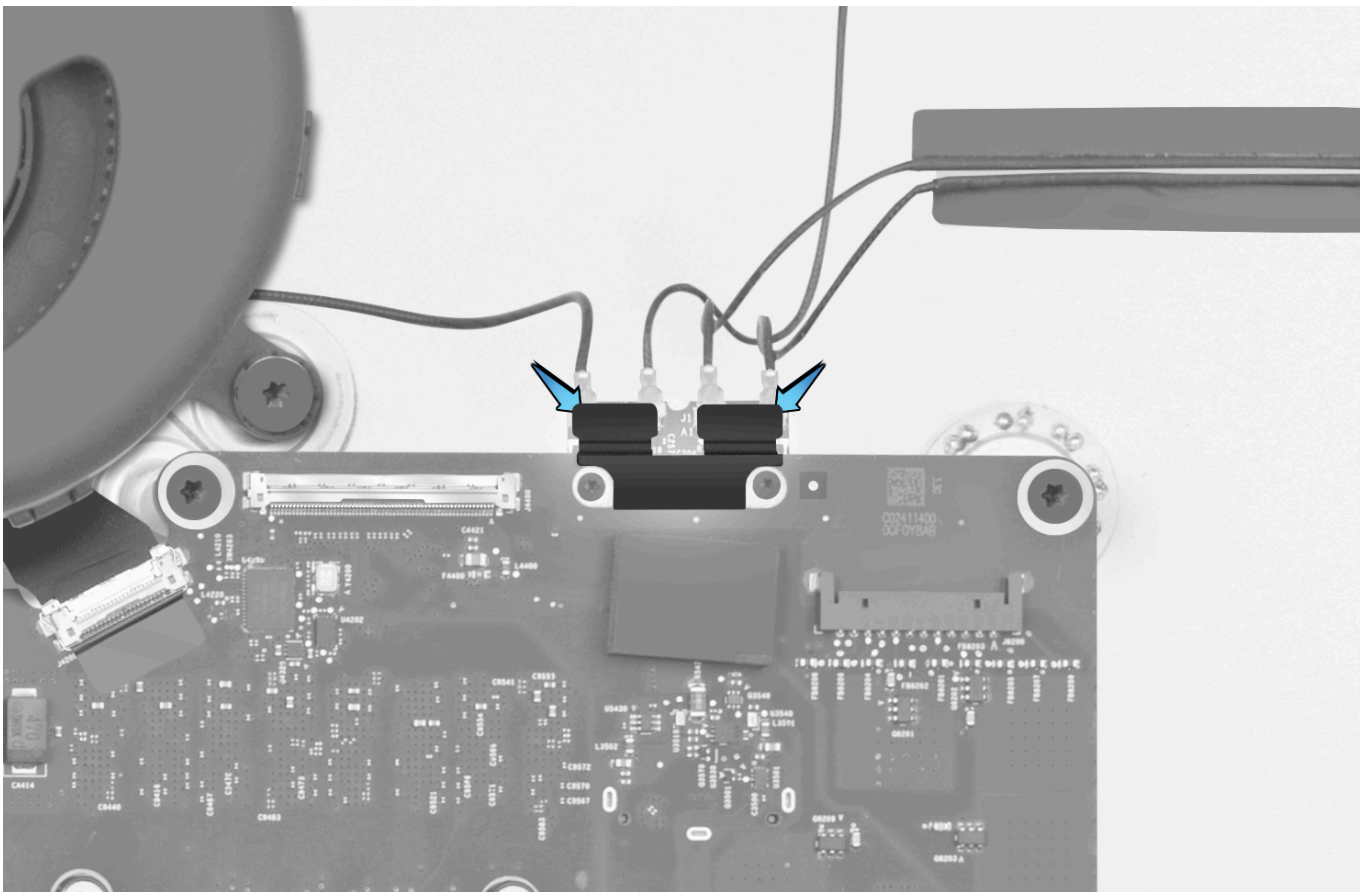
5. Reinstall the two T4 wireless card screws (923-0394).



6. After installing the logic board, connect the antenna cables. Begin with the logo antenna (the left-most connector), then continue attaching the antennas clockwise (upper antenna, mid antenna, lower antenna).



7. For the iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015), press the Mylar tape onto the antennas to secure the antennas to their connectors.



8. Replace the [power supply](#).
9. Replace the [hard drive](#).
10. Replace the [left speaker](#).
11. Replace the [right speaker](#).
12. Replace the [chin strap](#).
13. Replace the [fan](#).
14. Replace the [display panel VHB strips](#).
15. Replace the [display panel](#).

Wireless Card

First Steps

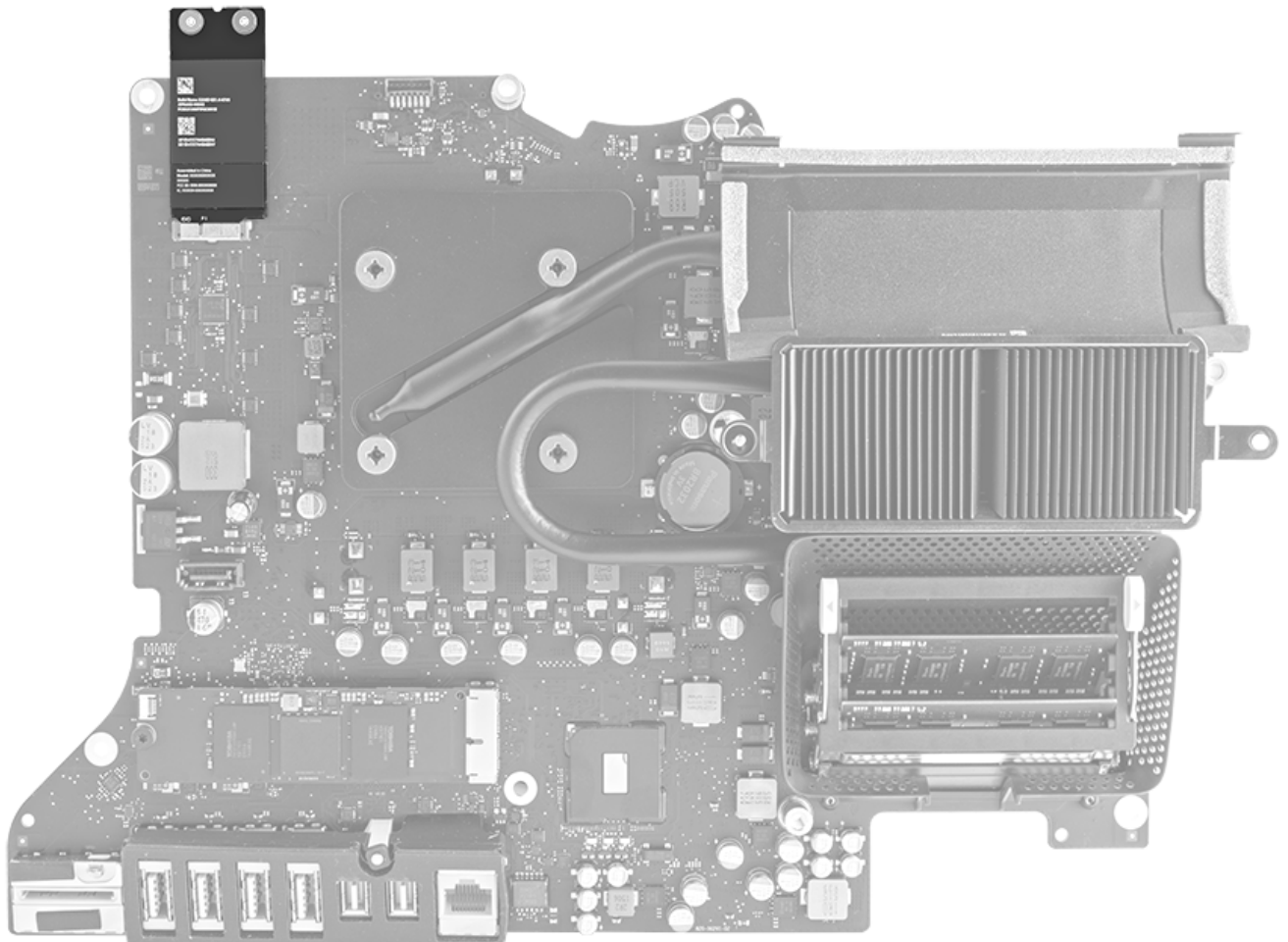
Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV293: Wireless Card Replacement Video](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#)

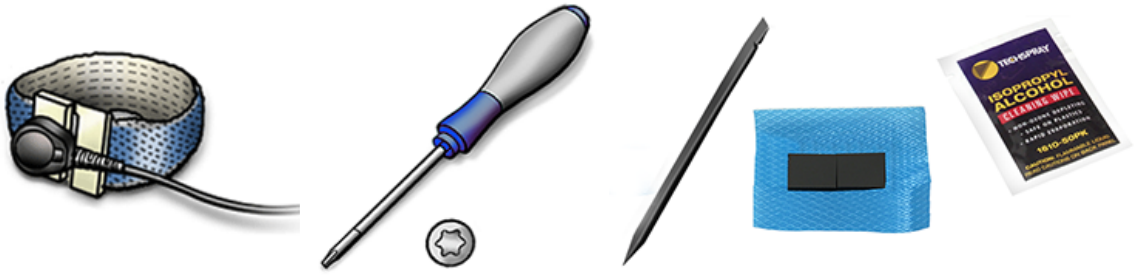
Caution: Do not remove the wireless card without taking out the logic board. Attempting to do this is likely to damage both the wireless card and the logic board. Additionally, the use of thermal material during installation will make it difficult to insert the card if the logic board has not been removed.



Tools

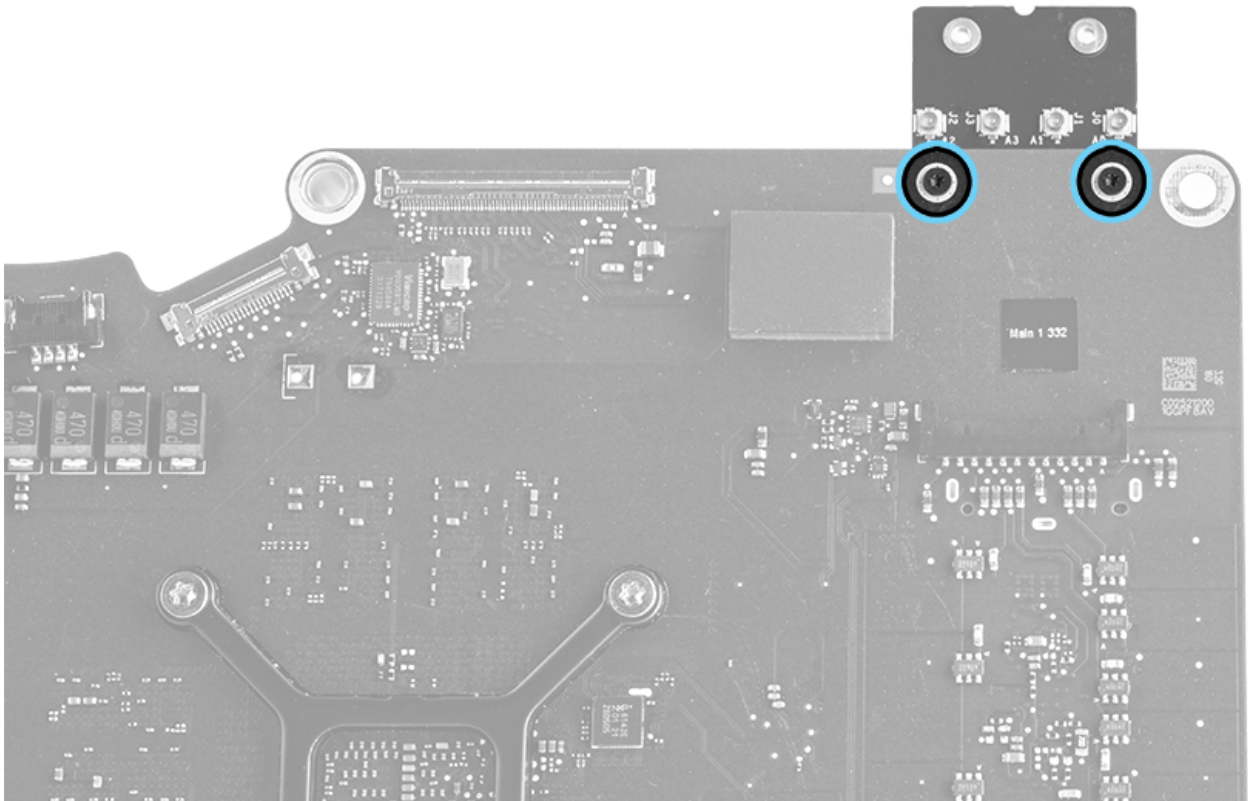
- ESD wrist strap and mat
- Magnetized Torx T4 screwdriver
- Black stick
- Thermal pad kit (076-1445)
- Isopropyl alcohol (IPA) wipes

Note: Whenever you remove or replace the wireless card, check for original thermal material. If it is present, then remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.



Steps For Removal

1. Remove the two Torx T4 (923-00670) screws that secure the wireless card to the logic board.

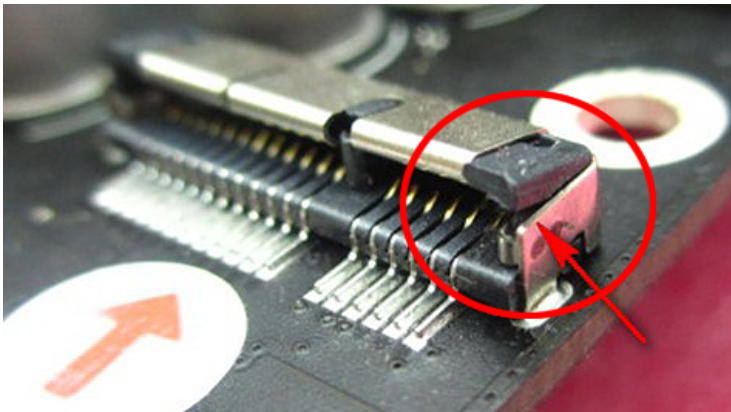


2. Turn over the logic board and use a black stick to gently loosen the bond of thermal material between the logic board and wireless card. **Important:** Exerting too much force when trying to loosen the bond of the thermal material could damage the wireless card connector (see the damaged connector in step 3).

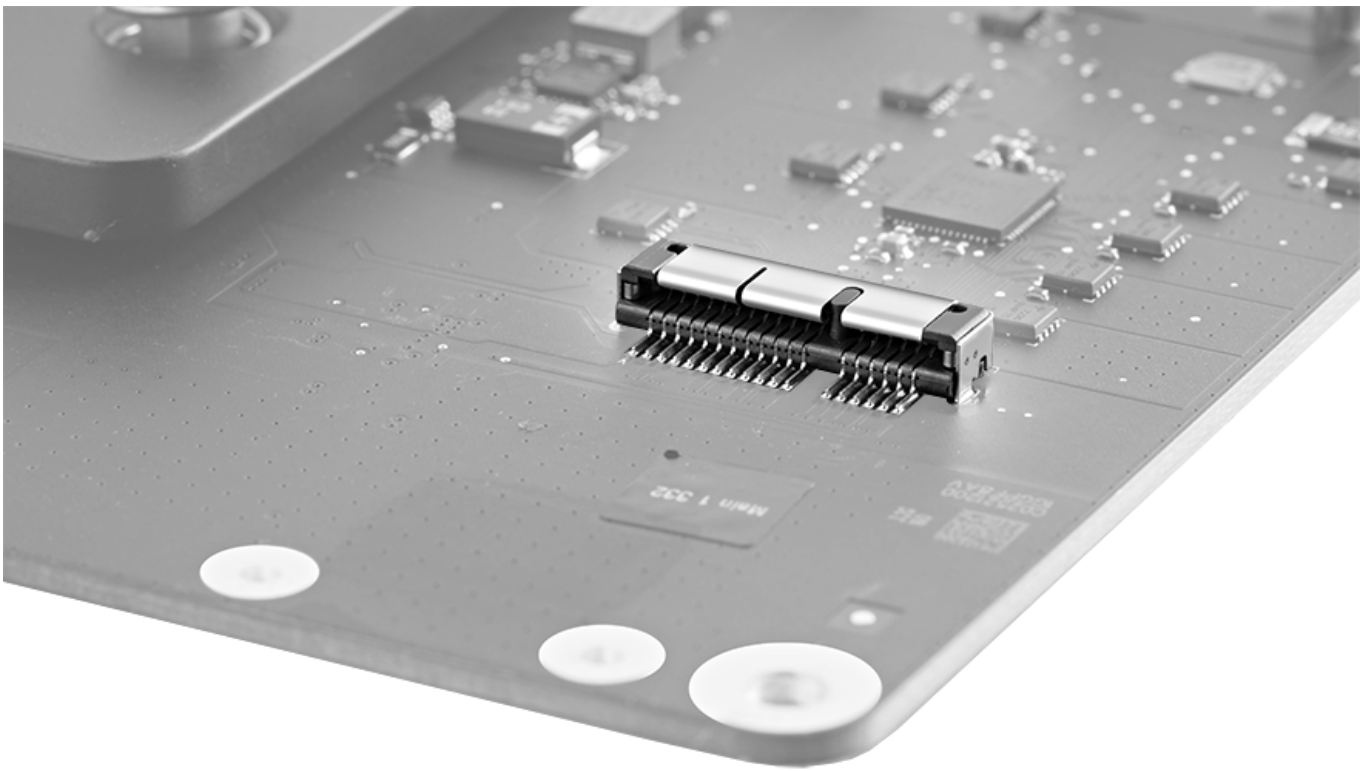


3. **Important:** A damaged wireless card connector requires a logic board replacement.

Damaged iMac (21.5-inch, Late 2012) wireless card connector:



Intact iMac (Retina 5K, 27-inch, Late 2015) wireless card connector:



4. Gently wiggle the wireless card straight out of the wireless card connector.



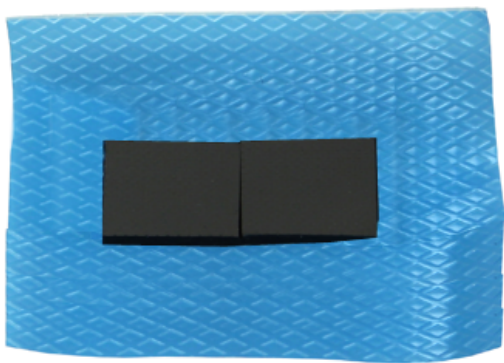
5. If thermal material is present, then use IPA wipes to carefully clean both the logic board and the wireless card. Harsh scraping can damage the delicate circuitry.

Steps For Reassembly

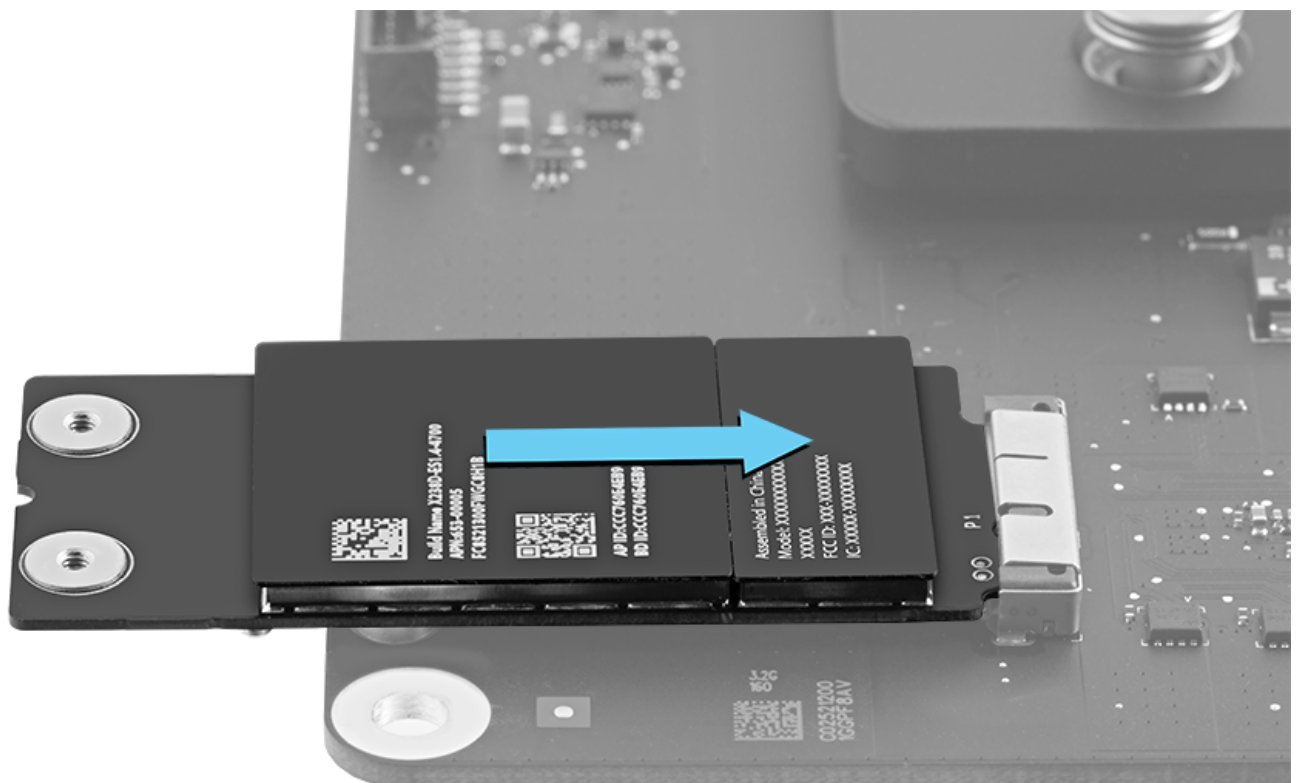
1. Check the condition of the thermal pad on the replacement wireless card. A damaged thermal pad shows uneven borders or lost adhesion.



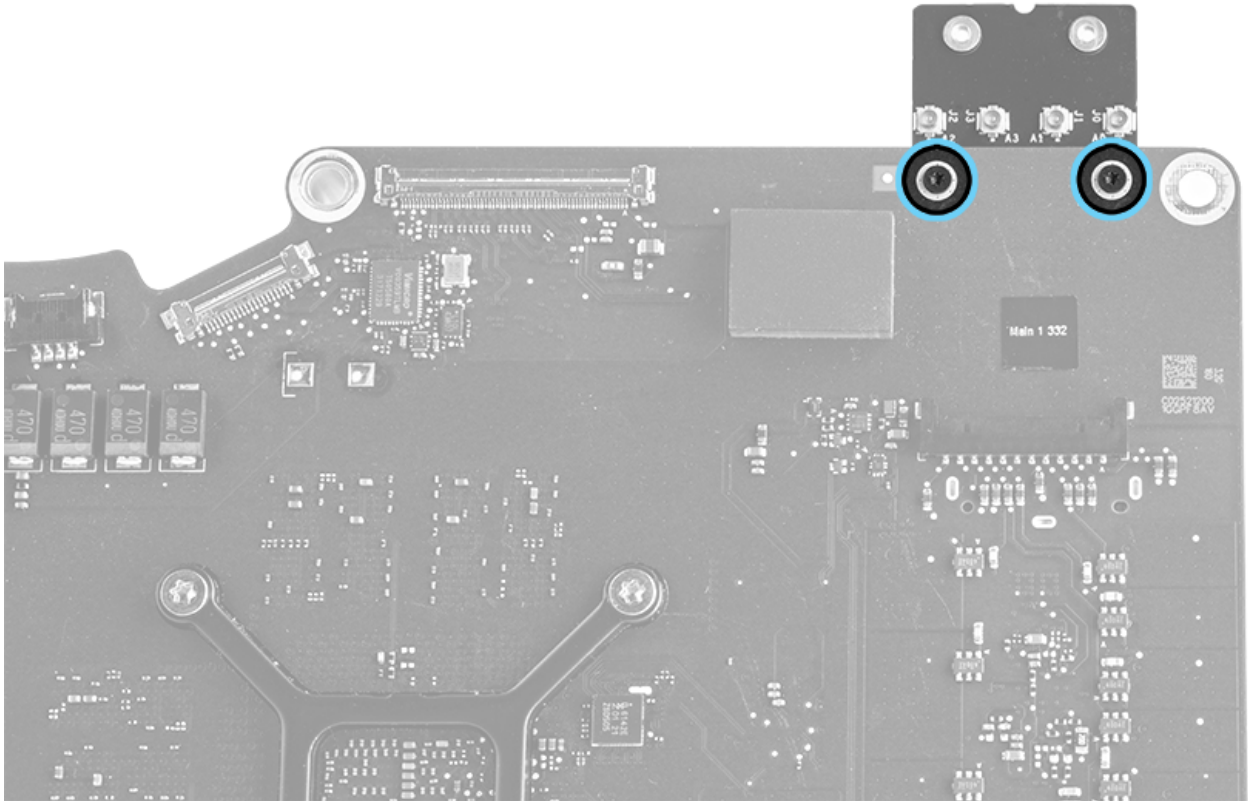
2. If a new thermal pad is required, then use one from the thermal pad kit (076-1445). Attach one thermal pad to the card.



3. Hold the wireless card by the edges and slide it into the connector on the logic board.



4. Turn over the logic board and install the two T4 (923-00670) screws.



5. Reinstall the [logic board](#).
6. Reinstall the [power supply](#).
7. Reinstall the [hard drive](#).
8. Reinstall the [left speaker](#).
9. Reinstall the [right speaker](#).
10. Reinstall the [chin strap](#).
11. Reinstall the [fan](#).
12. Install new [display panel VHB strips](#).
13. Reinstall the [display panel](#).

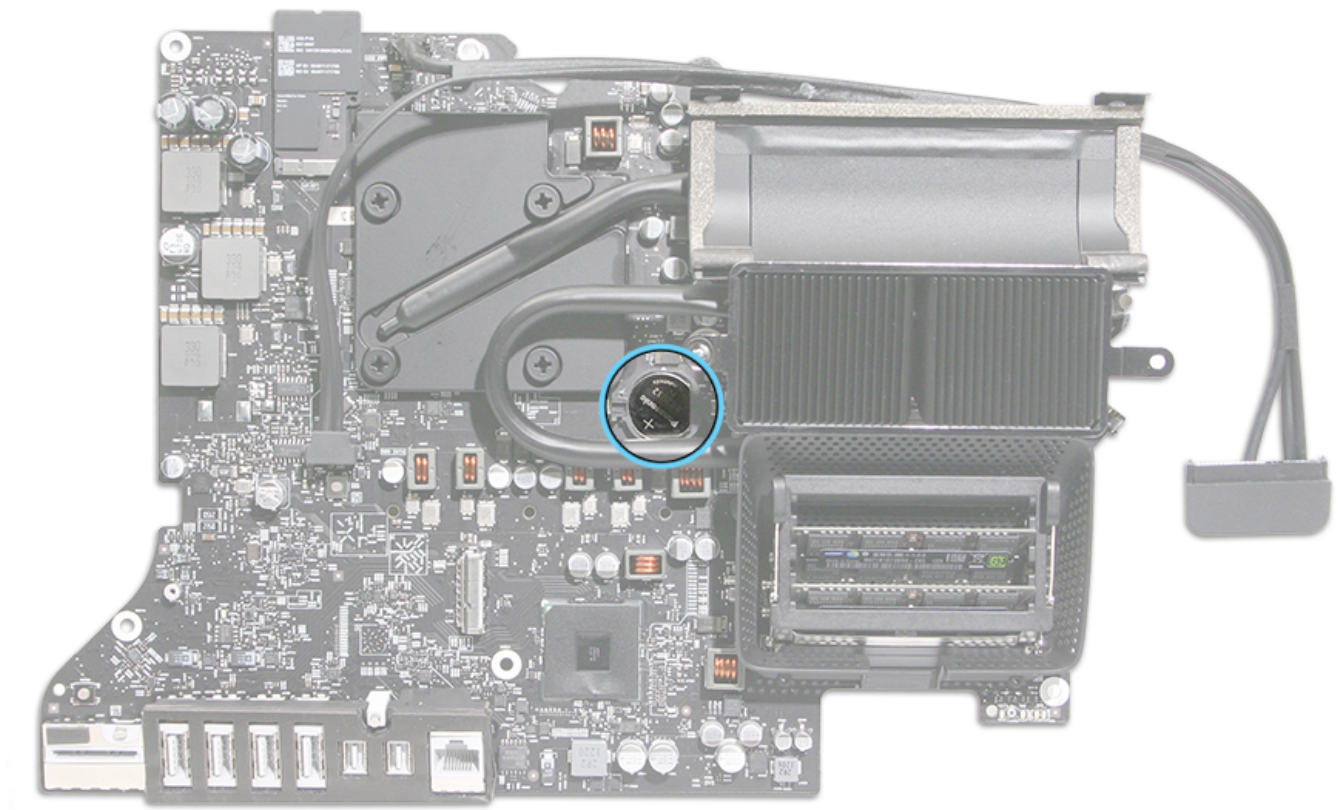
Battery

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)



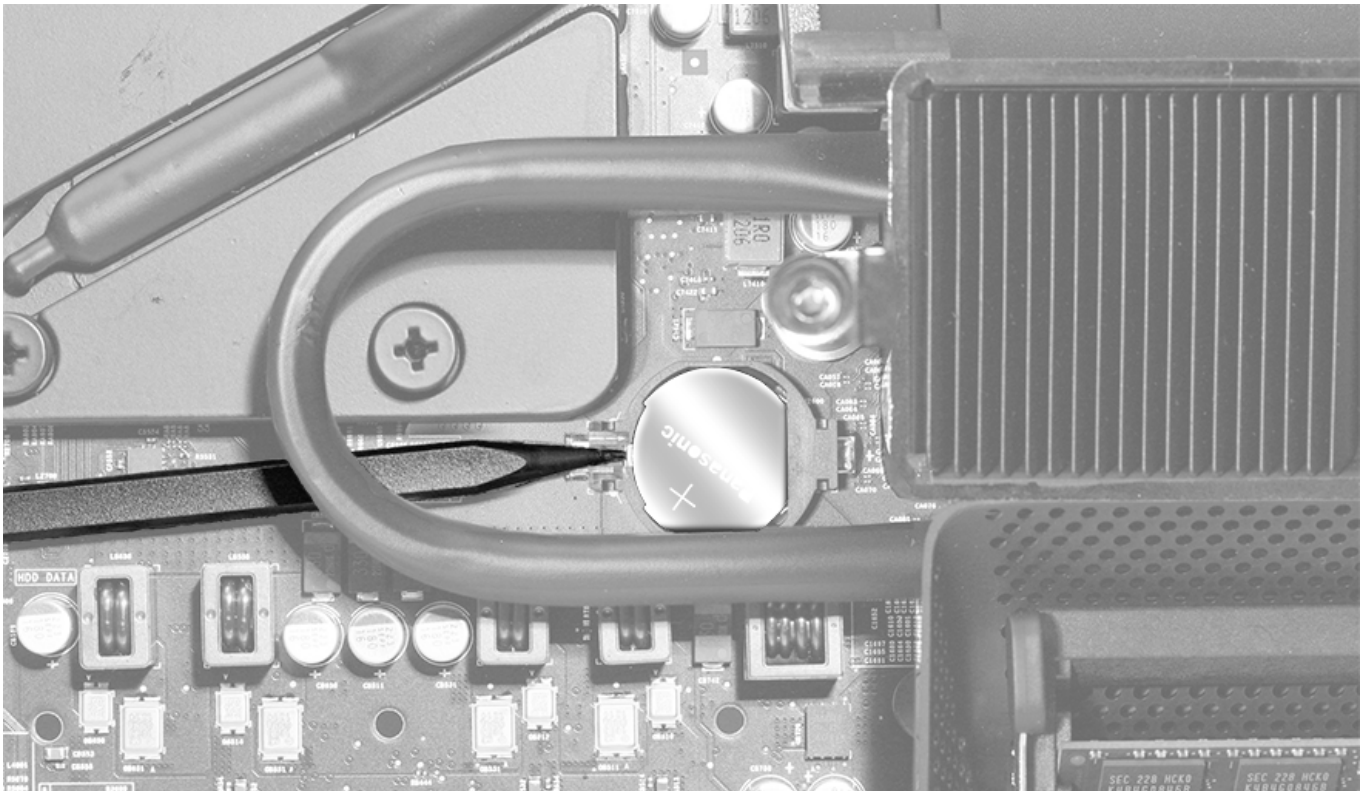
Tools

- ESD mat and wrist strap
- Black stick
- Service wedge (iMac)



Steps For Removal

1. Use a black stick to push the battery into the battery socket. The battery will spring out of the socket.



Steps For Reassembly



Warning: If the battery is installed incorrectly or replaced with an incorrect type of battery, there is a risk of explosion. Dispose of used batteries according to local environmental laws and guidelines.

Note: Effective immediately, some coin cell batteries used on Mac systems are now available only from electronics parts distributors (for example, MCM). The coin battery noted below is no longer available to order via GSX. When the Mac repair process indicates the noted coin battery needs to be replaced, please order it from an electronics parts distributor. **Note:** BR2032 and CR2032 batteries have the same form factor and nominal voltage. However, BR2032 batteries have a lower self-discharge rate and broader operating temperature range than CR2032 batteries for longer shelf and service life.

1. Check that the battery socket is open and free of dust.
2. Slide the battery (922-9869) into the socket with the engraved markings (+ side) facing up.



3. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
4. Reinstall the [power supply](#).
5. Reinstall the [hard drive](#).
6. Reinstall the [left speaker](#).
7. Reinstall the [right speaker](#).
8. Reinstall the [chin strap](#).
9. Reinstall the [fan](#).
10. Install new [display panel VHB strips](#).
11. Reinstall the [display panel](#).

Hard Drive Data and Power Cable

First Steps

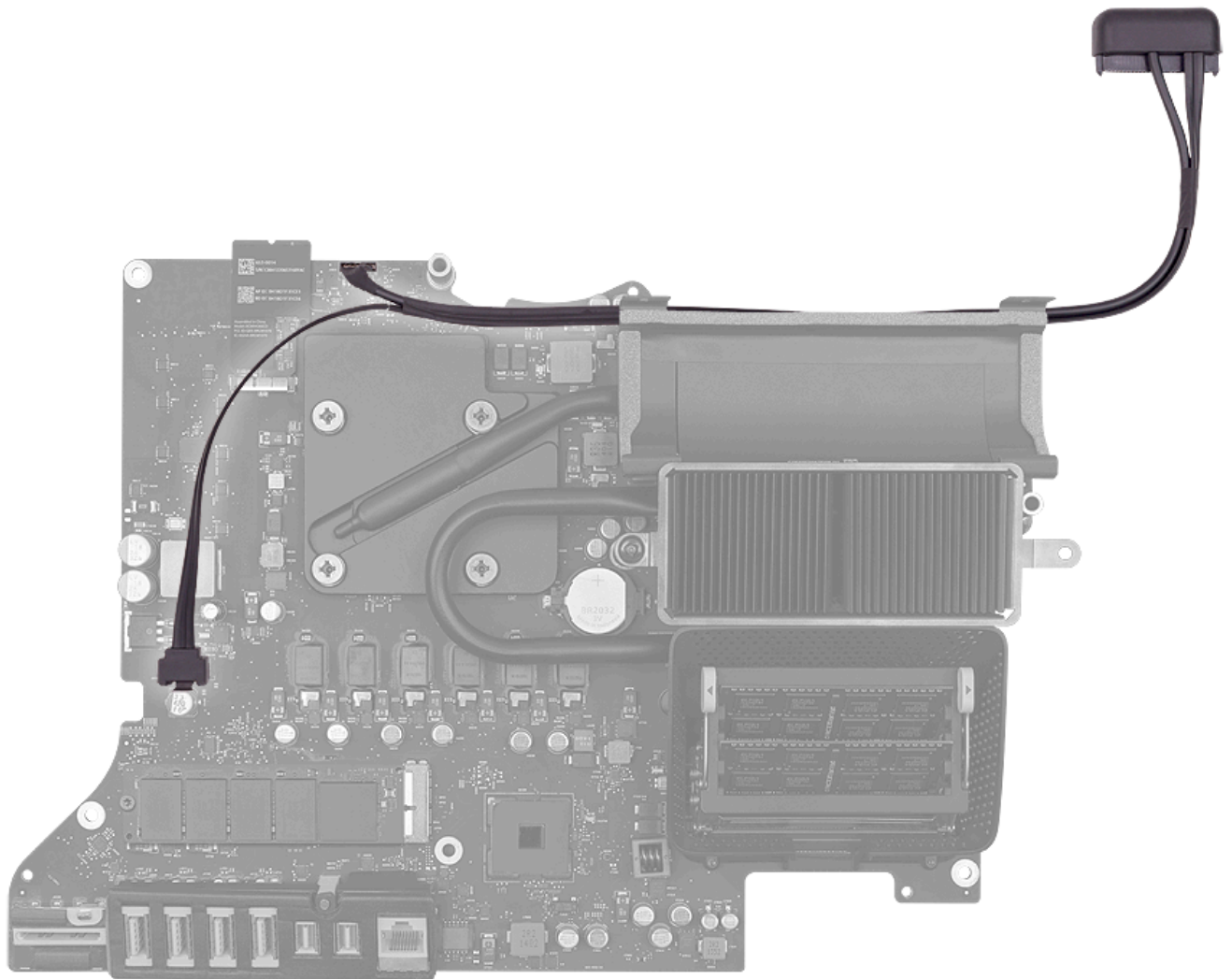
Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

For video instruction, refer to article [SV247: Hard Drive Cables Replacement Video](#).

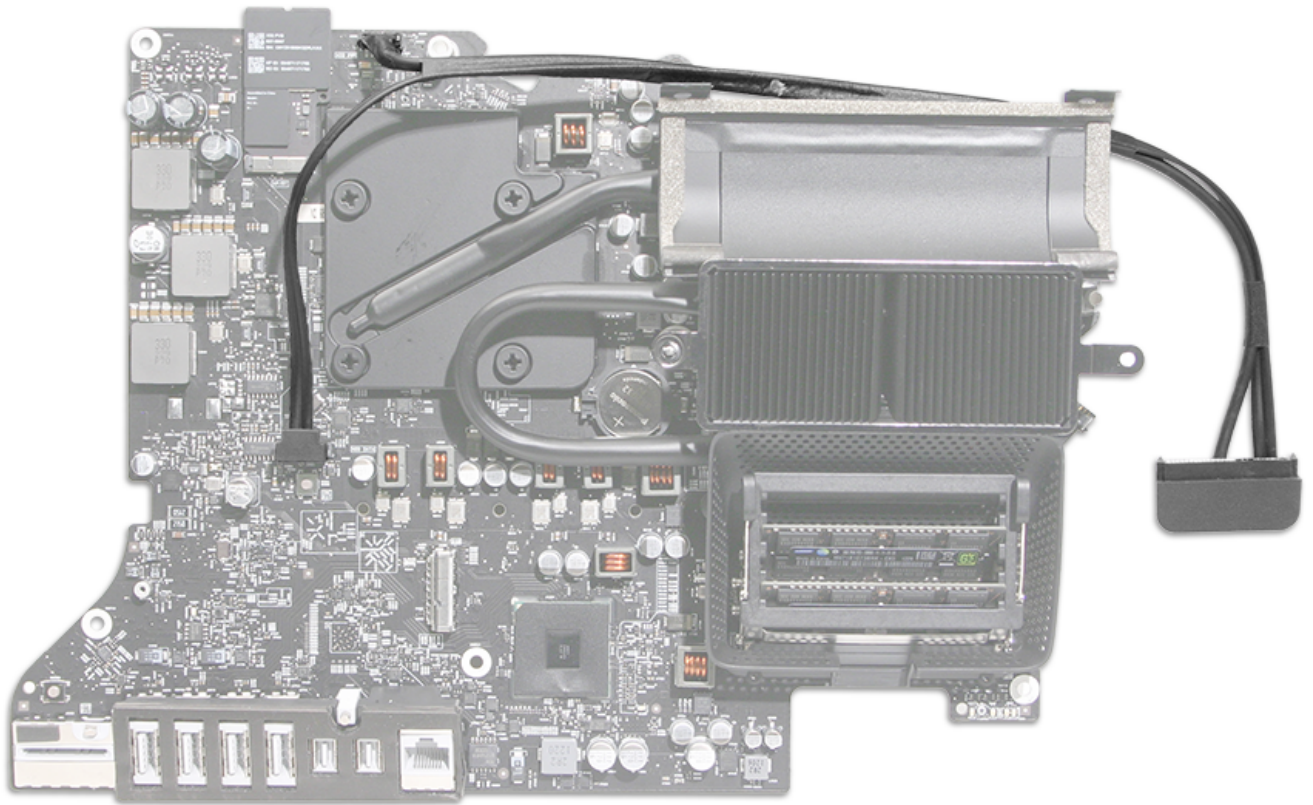
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)

iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



iMac (27-inch, Late 2012 and Late 2013)



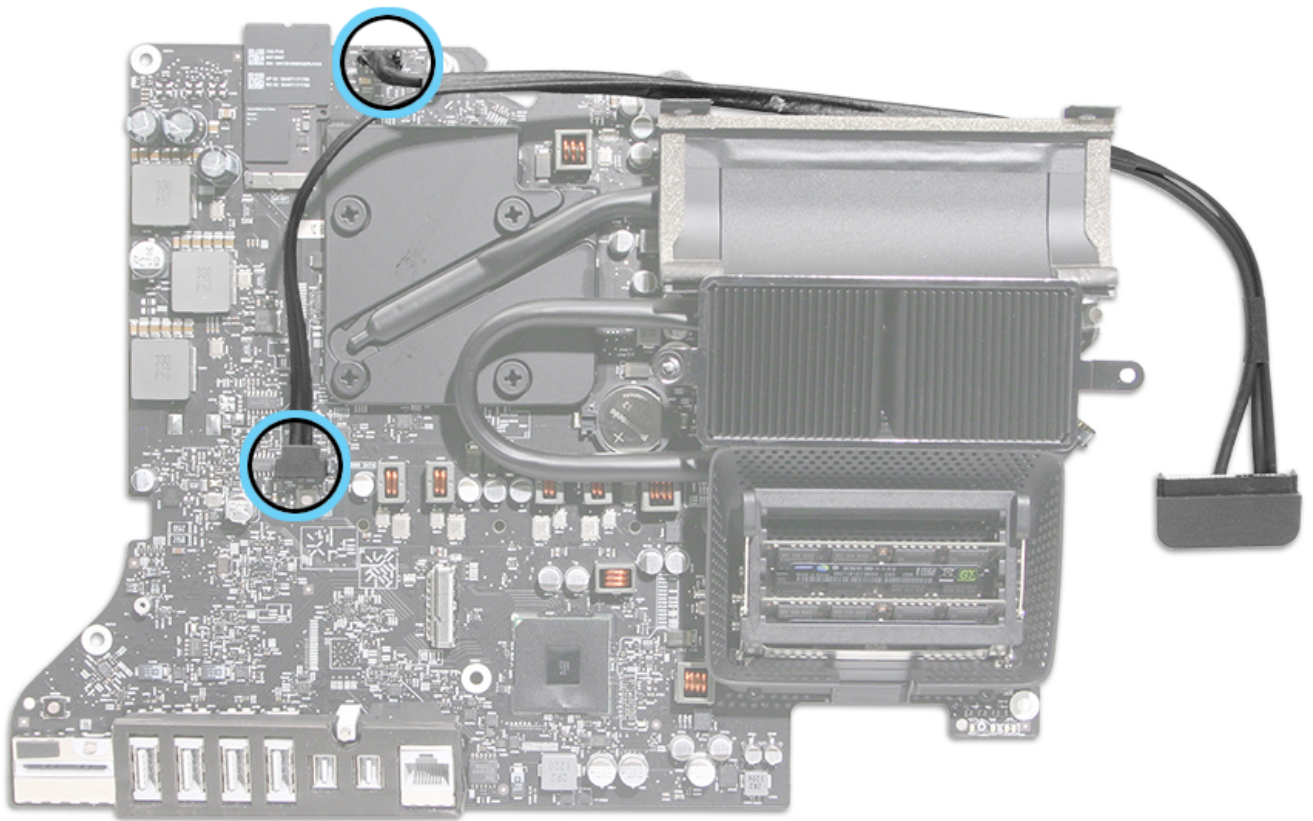
Tools

- ESD wrist strap and mat



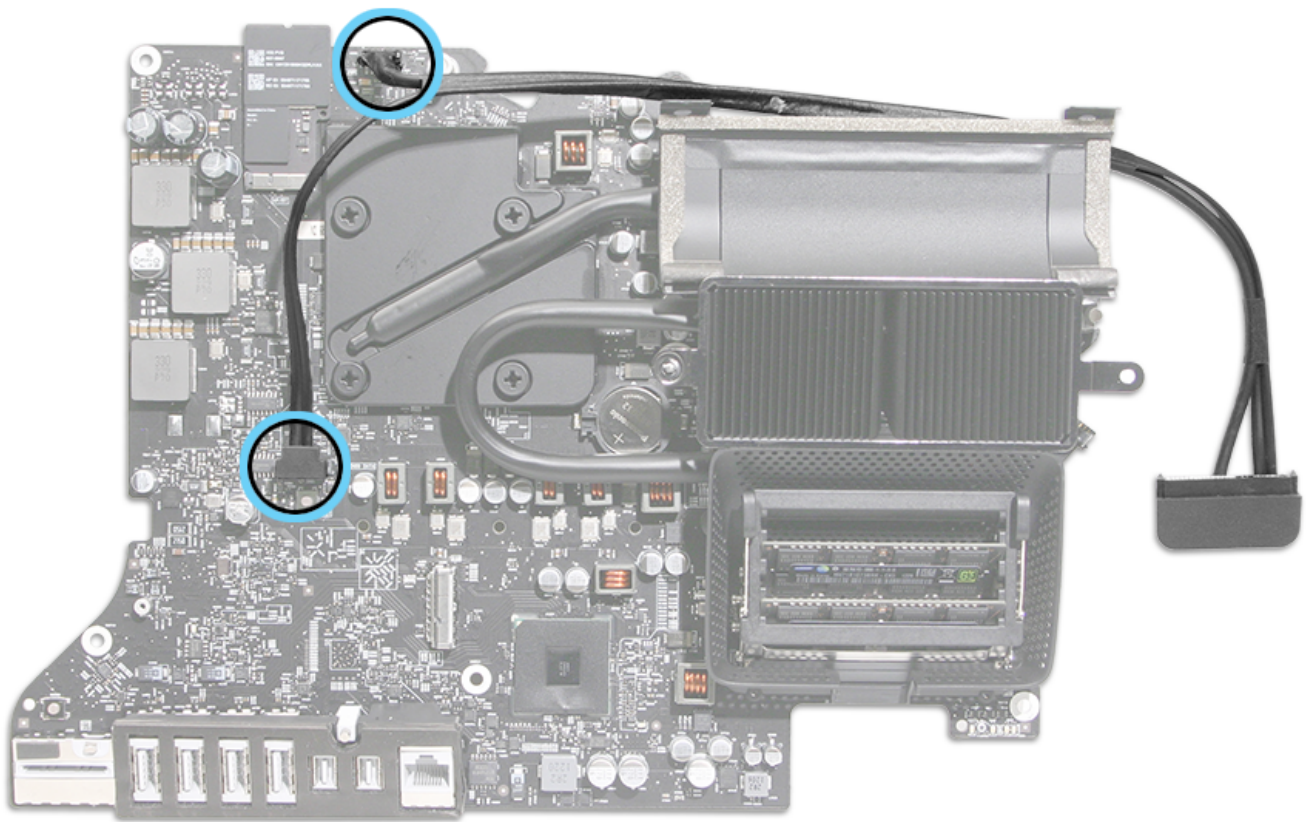
Steps For Removal

1. Disconnect the hard drive data and power cable from the two connectors on the logic board.



Steps For Reassembly

1. Connect the hard drive data and power cable to the two connectors on the logic board.



2. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
3. Reinstall the [power supply](#).
4. Reinstall the [hard drive](#).
5. Reinstall the [left speaker](#).

6. Reinstall the [right speaker](#).
7. Reinstall the [chin strap](#).
8. Reinstall the [fan](#).
9. Install new [display panel VHB strips](#).
10. Reinstall the [display panel](#).

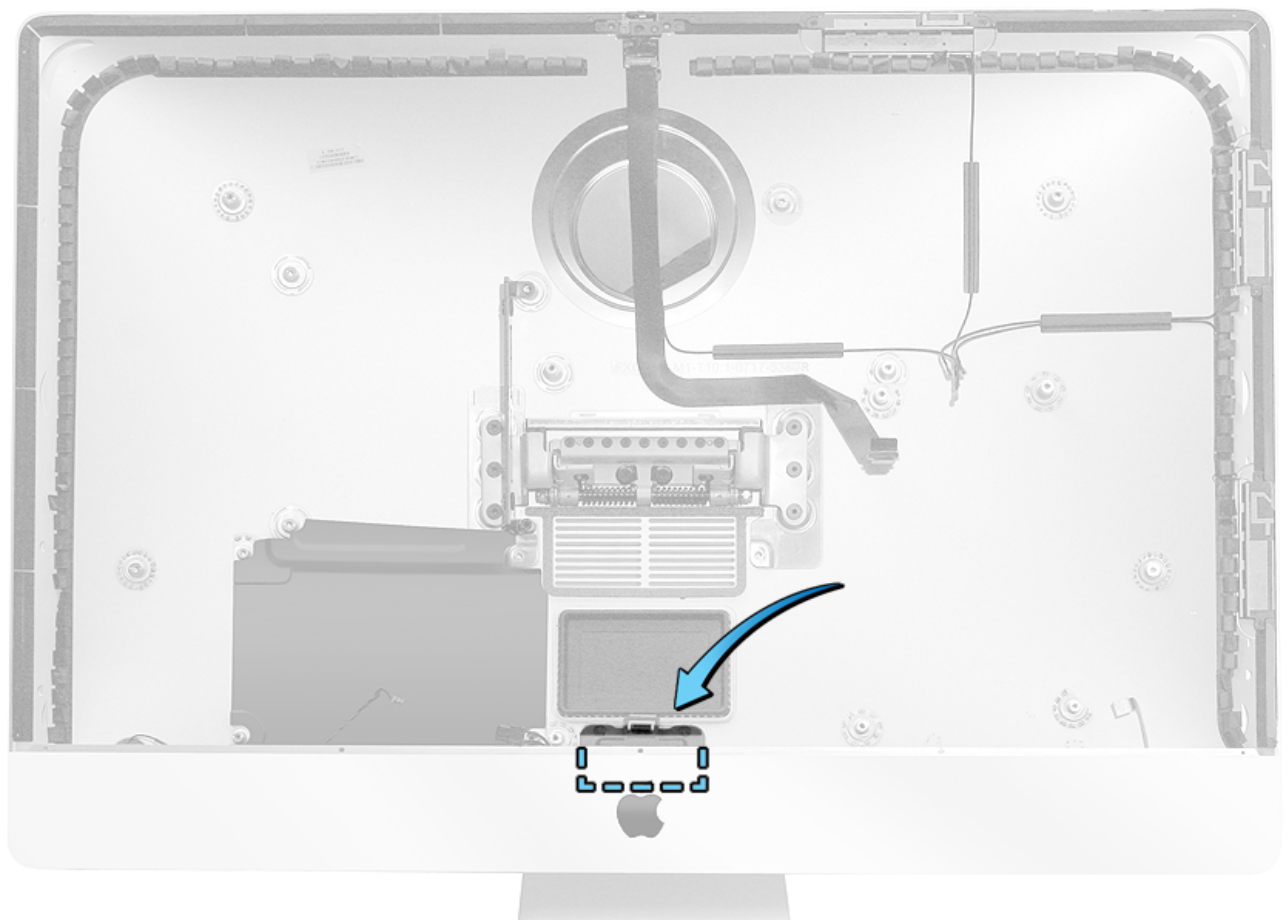
RAM Access Door Lock Mechanism

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

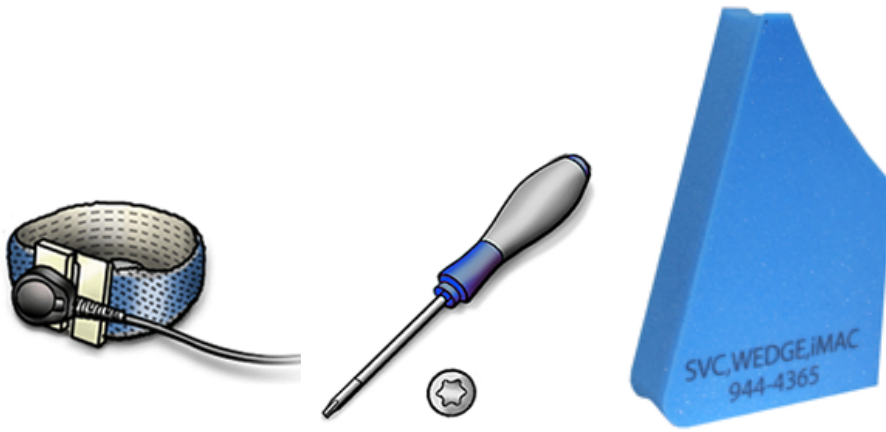
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)



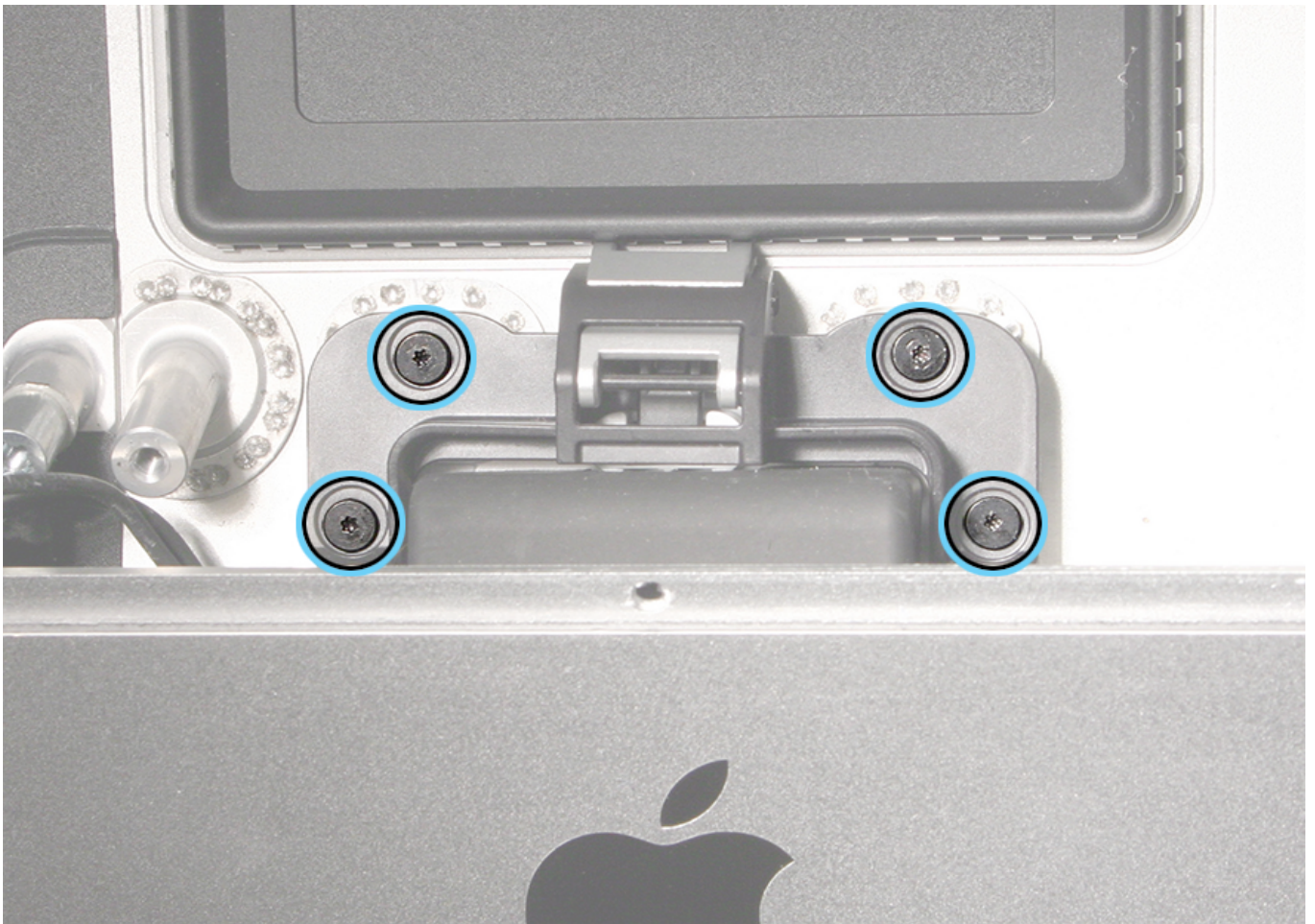
Tools

- ESD wrist strap and mat
- Torx T5 screwdriver (magnetized)
- Service wedge (iMac)



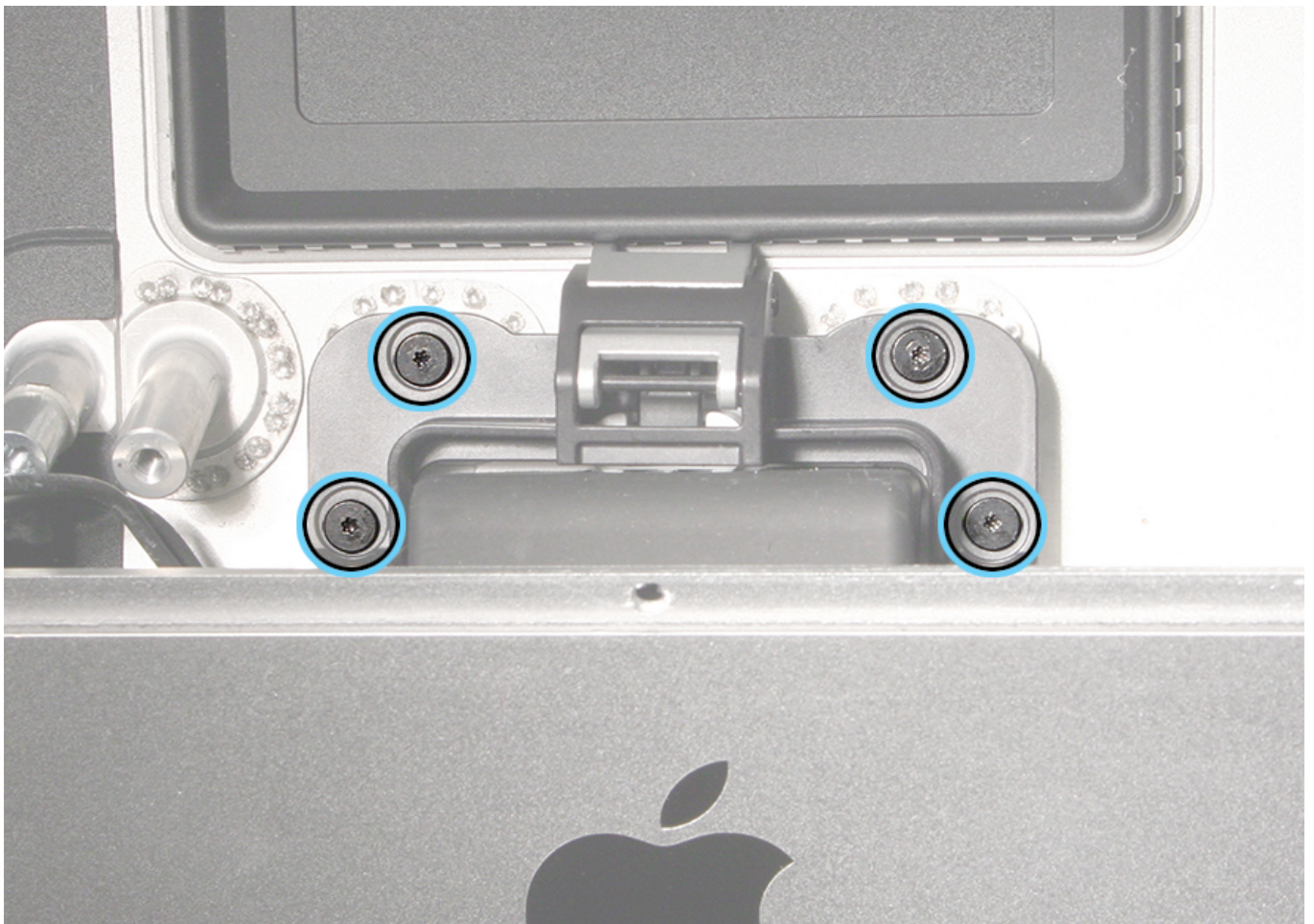
Steps For Removal

1. Remove four T5 (6.5 mm) screws (923-0404).
2. Lift the RAM access door lock mechanism out of the rear housing.



Steps For Reassembly

1. Insert the RAM access door into the rear housing. Line up the screw holes.
2. Install the four T5 screws.



3. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
4. Reinstall the [power supply](#).
5. Reinstall the [hard drive](#).
6. Reinstall the [left speaker](#).
7. Reinstall the [right speaker](#).
8. Reinstall the [chin strap](#).
9. Reinstall the [fan](#).
10. Install new [display panel VHB strips](#).
11. Reinstall the [display panel](#).

Stand

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

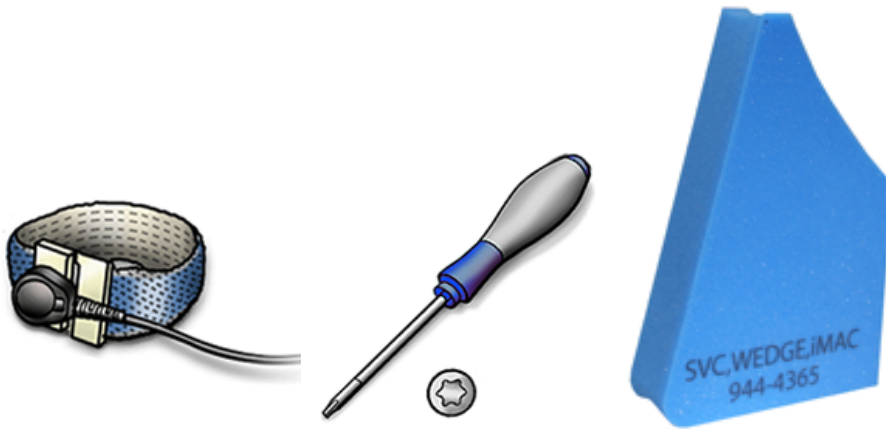
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)



Tools

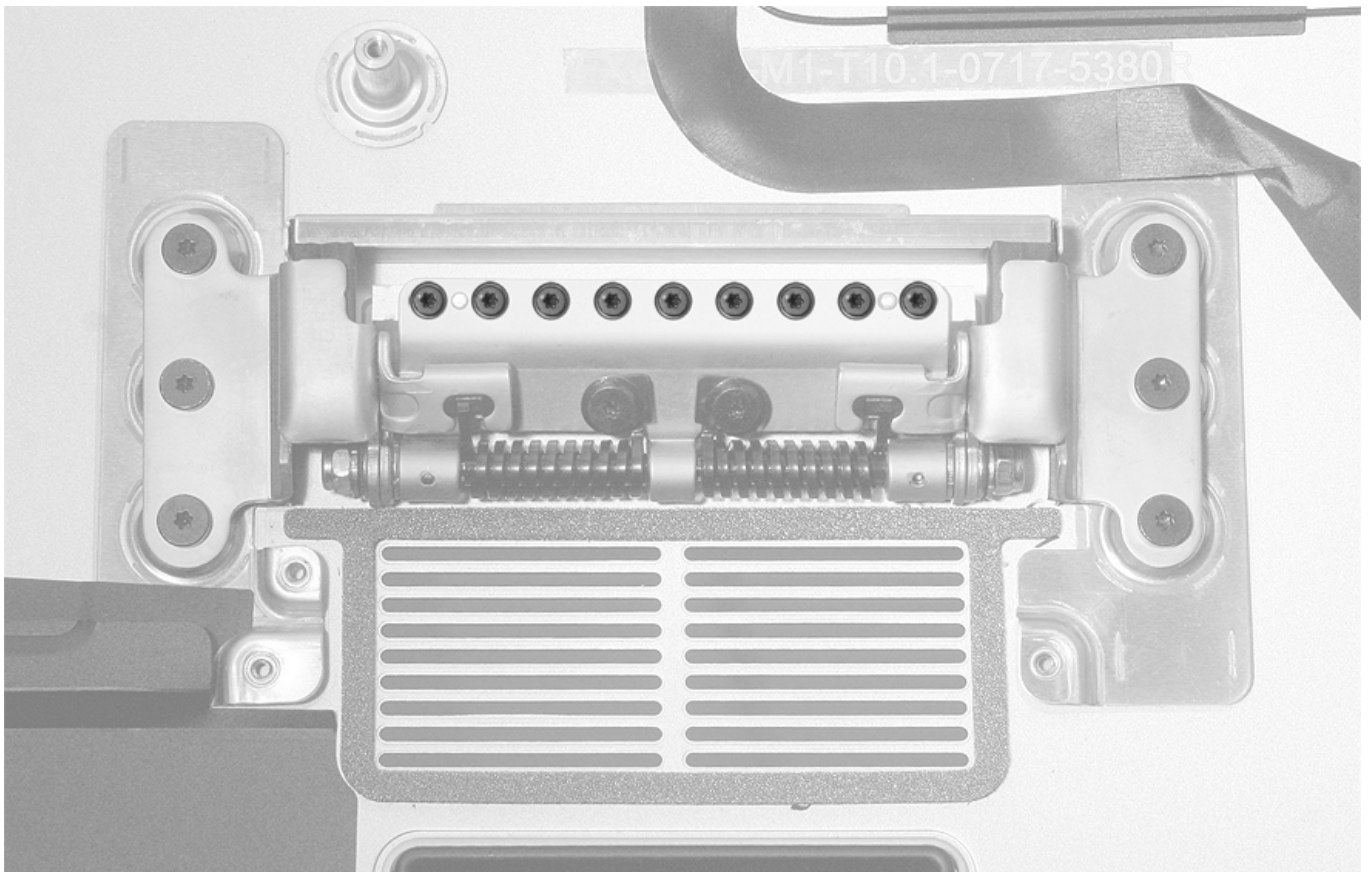
- ESD wrist strap and mat
- Torx T8 screwdriver (magnetized)
- Service wedge (iMac)



Steps For Removal

1. Remove nine T8 screws.

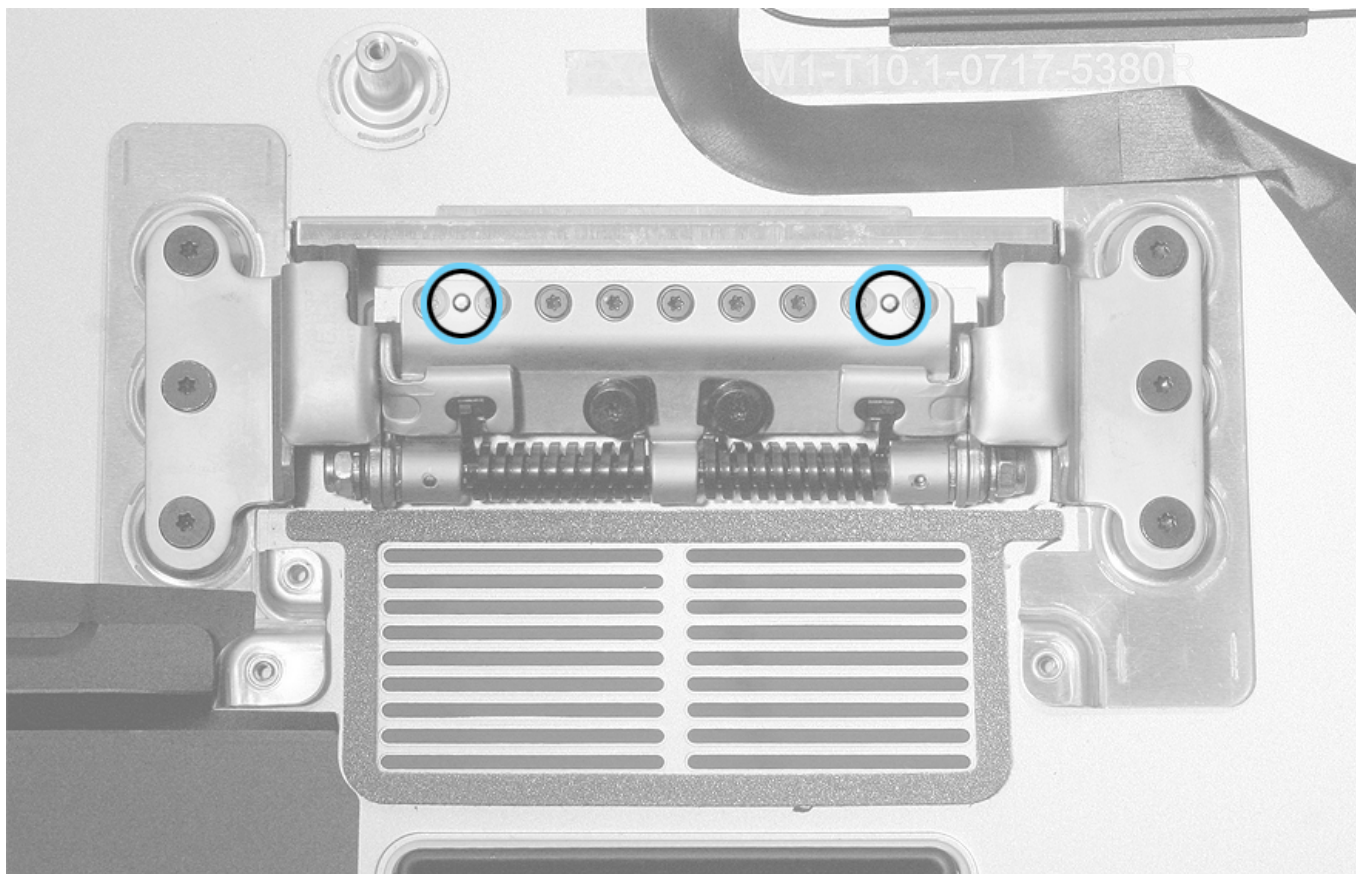
- 923-00529, 7.5 mm



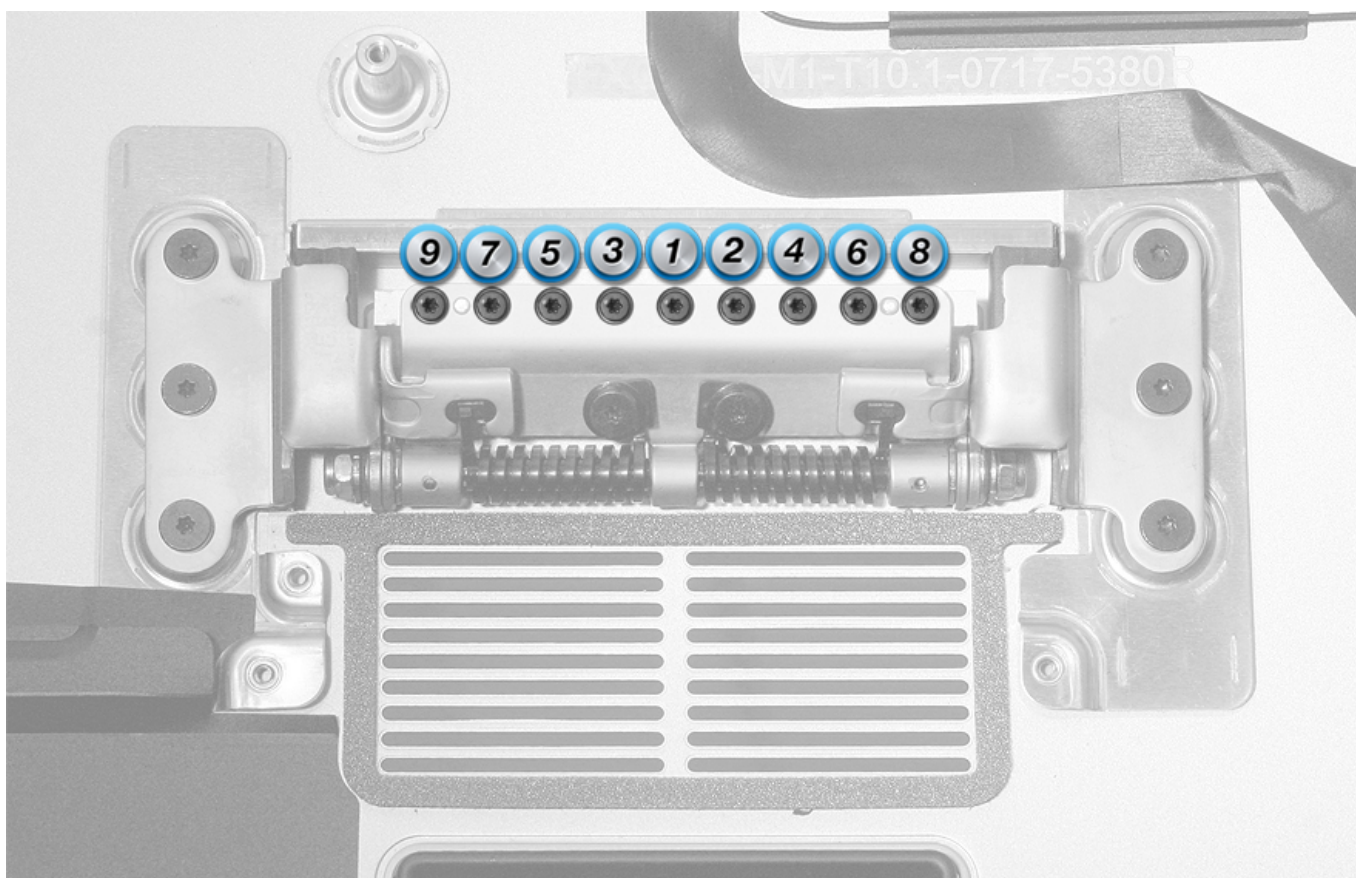
2. Lift the rear housing off of the stand, separating the stand from the mechanism.

Steps For Reassembly

1. Line up the two pins on the stand with the pin holes on the mechanism.



2. Replace the screws in the order shown.



3. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.

4. Reinstall the [power supply](#).

5. Reinstall the [hard drive](#).

6. Reinstall the [left speaker](#).

7. Reinstall the [right speaker](#).
8. Reinstall the [chin strap](#).
9. Reinstall the [fan](#).
10. Install new [display panel VHB strips](#).
11. Reinstall the [display panel](#).

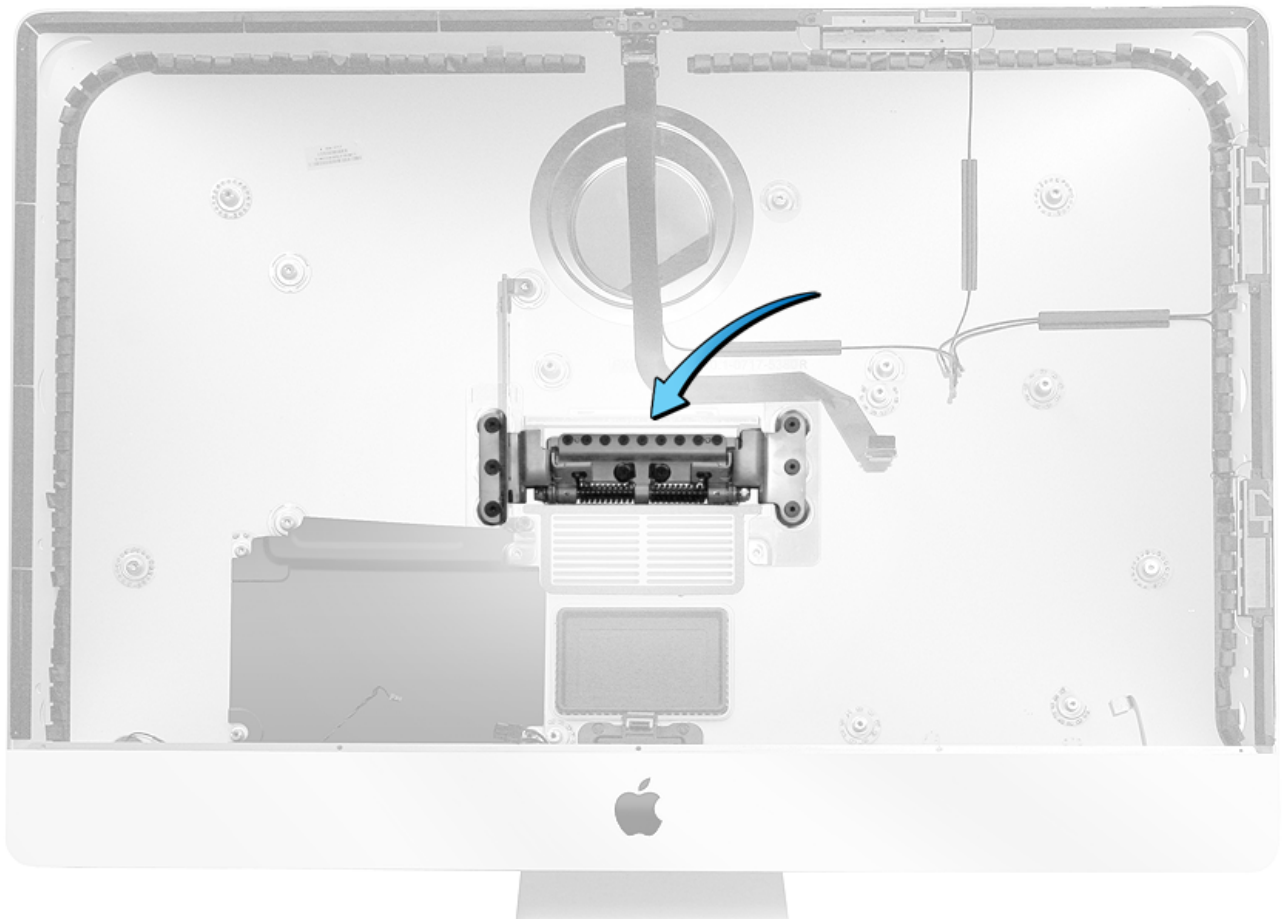
Mechanism

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

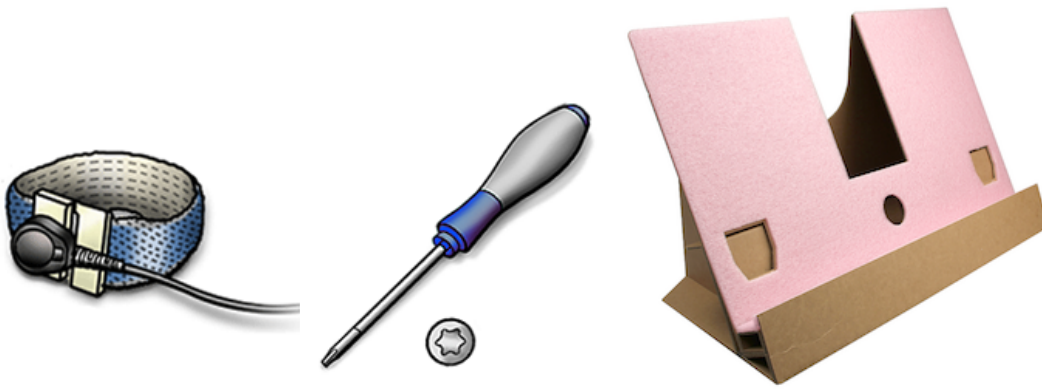
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)
- [Stand](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver
- LCD service support stand (923-0416)



Steps For Removal

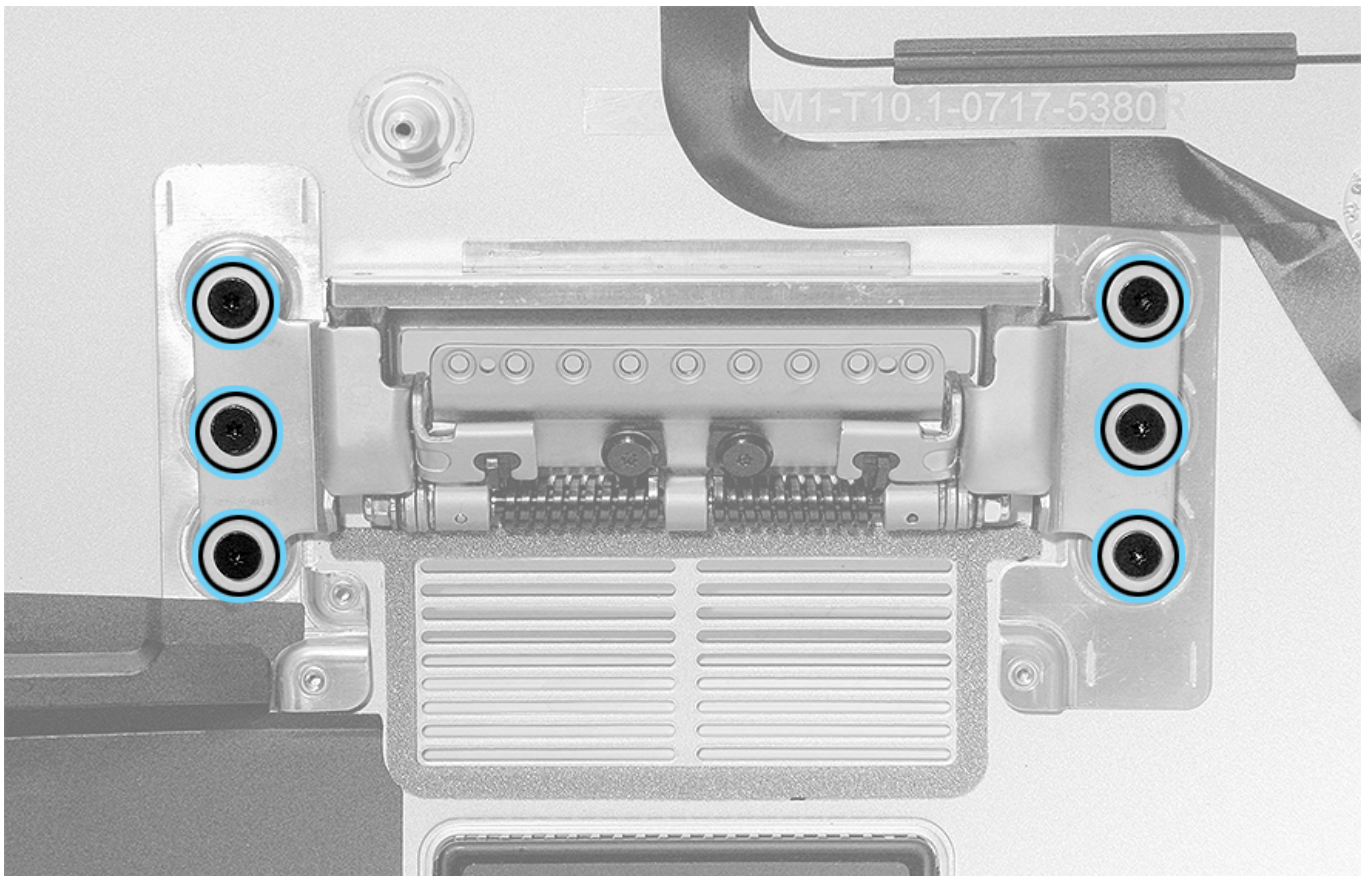
1. Place the rear housing in the LCD service support stand. Remove six T10 screws:

- 923-0334 (5.8 mm)



2. Lift the mechanism off of the rear housing.

Note: There is a different mechanism for the flash storage (SSD only) configuration (923-0376).

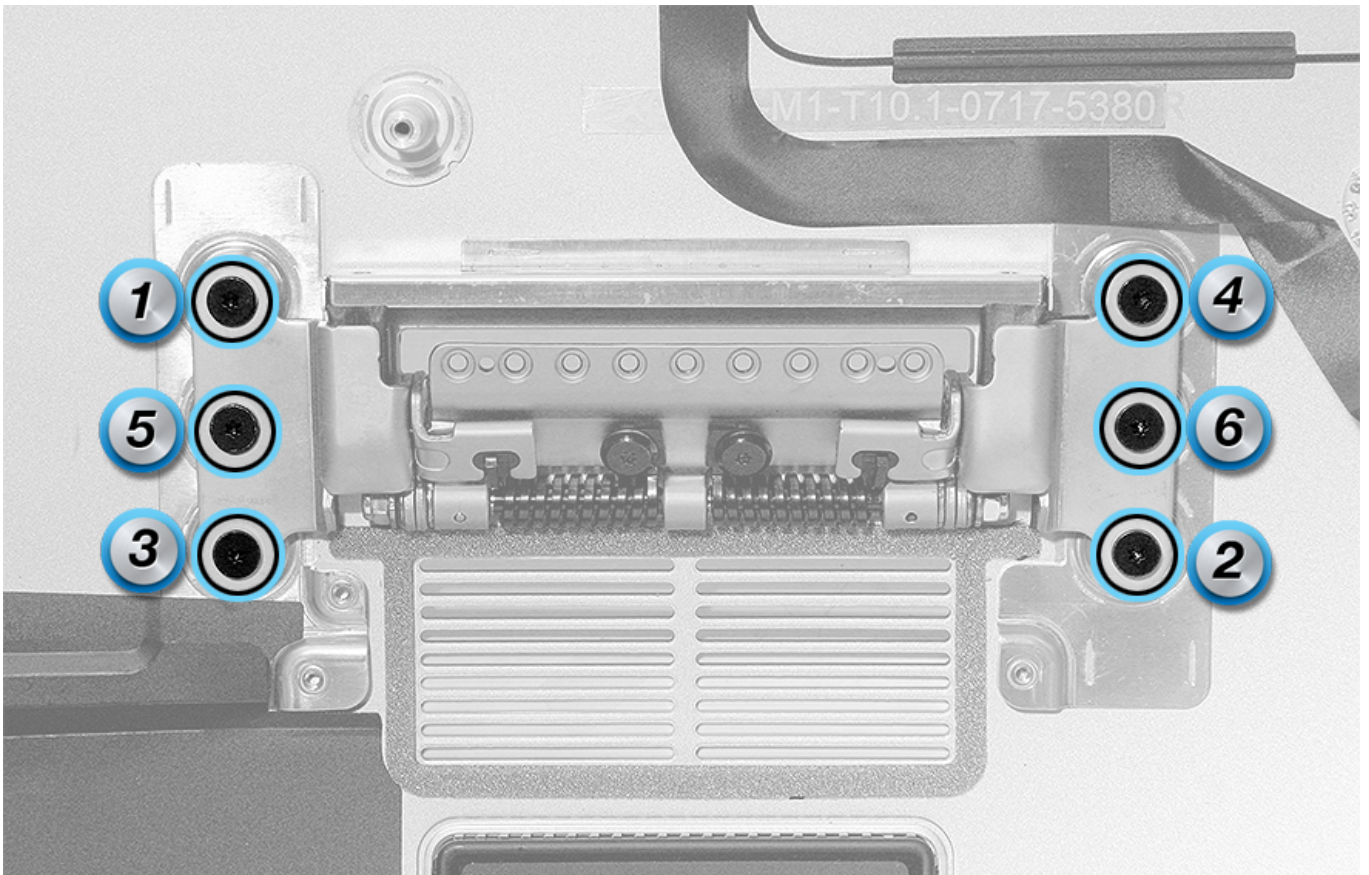


Steps For Reassembly

1. Position the mechanism in the center of the rear housing.

2. Install six T10 screws in the following order:

- 923-0334 (5.8 mm)



3. Reinstall the [stand](#).
4. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
5. Reinstall the [power supply](#).
6. Reinstall the [hard drive](#).
7. Reinstall the [left speaker](#).
8. Reinstall the [right speaker](#).
9. Reinstall the [chin strap](#).
10. Reinstall the [fan](#).
11. Install new [display panel VHB strips](#).
12. Reinstall the [display panel](#).

Rear Housing

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT205332: About AppleCare service certifications](#).

Remove:

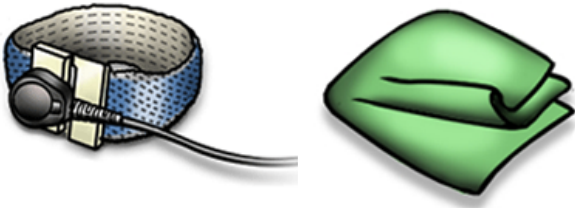
- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Camera](#)
- [Camera/microphone cable](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Bluetooth antenna](#) (Late 2012 to Mid 2015)
- [Bluetooth antenna](#) (Late 2015)
- [Middle Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Middle Wi-Fi antenna](#) (Late 2015)
- [Lower Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Lower Wi-Fi antenna](#) (Late 2015)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015 only)
- [Stand](#)



Tools

- ESD wrist strap and mat

- Lint-free cloth



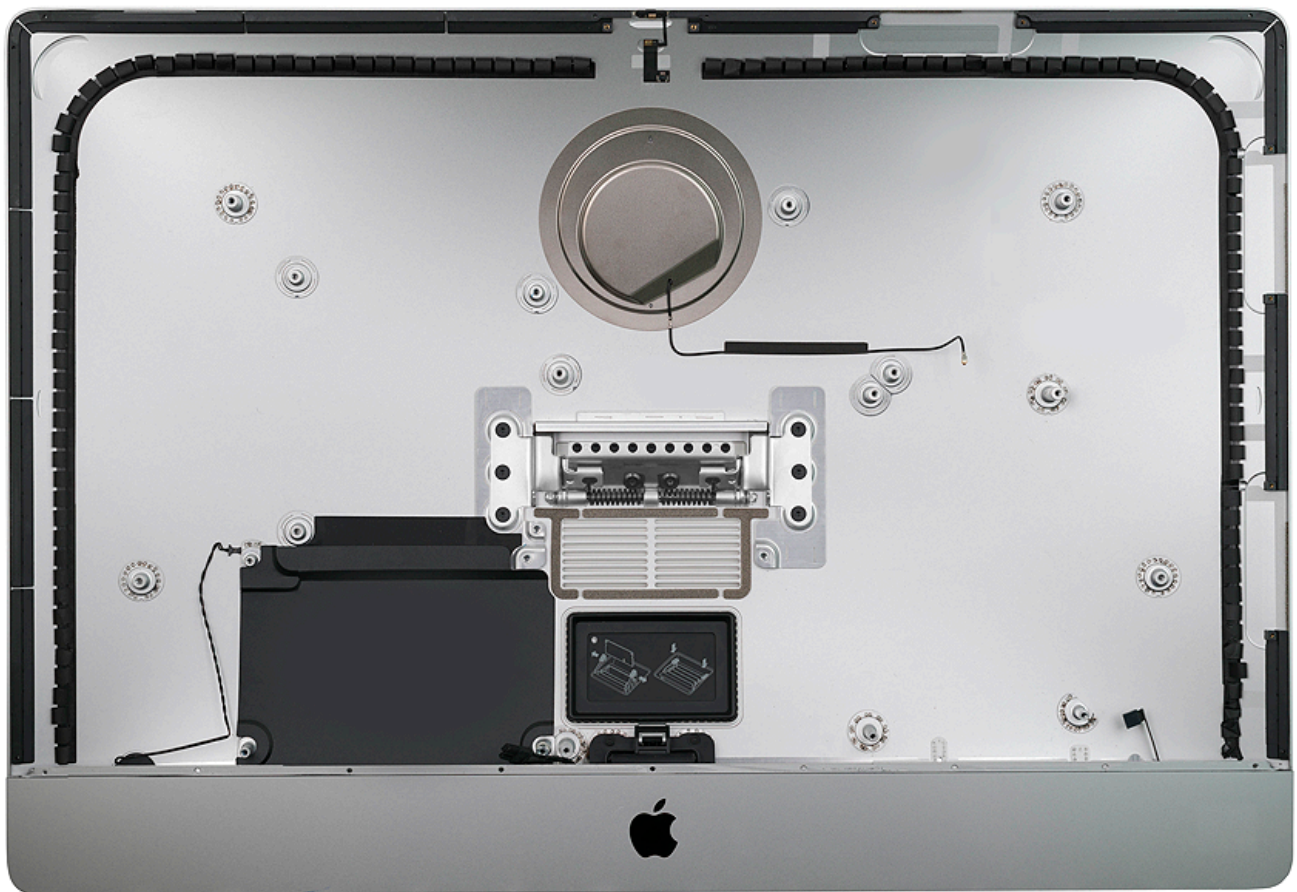
Steps For Removal

When all other modules have been removed, the rear housing is the remaining part.

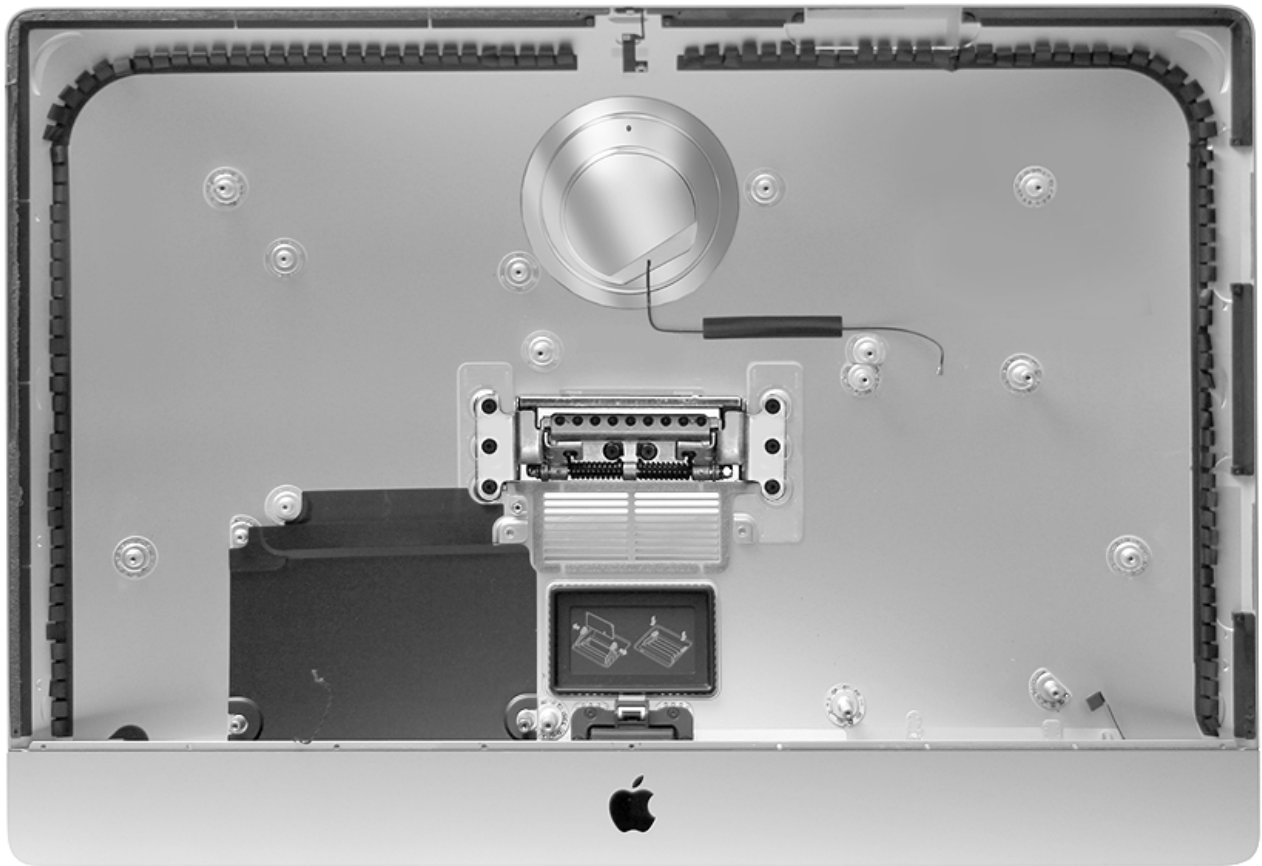
- iMac (Late 2012 and Late 2013) use rear housing 923-0522
- iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015) use rear housing 923-00081
- iMac (Retina 5K, 27-inch, Late 2015) uses rear housing 923-00650, or VESA rear housing 923-00651

Note: The 5-hole rear housing has been replaced by the 9-hole rear housing assembly.

iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) Rear Housing



iMac (Late 2012 and Late 2013) Rear Housing



The rear housing includes the following parts, which are also available separately:

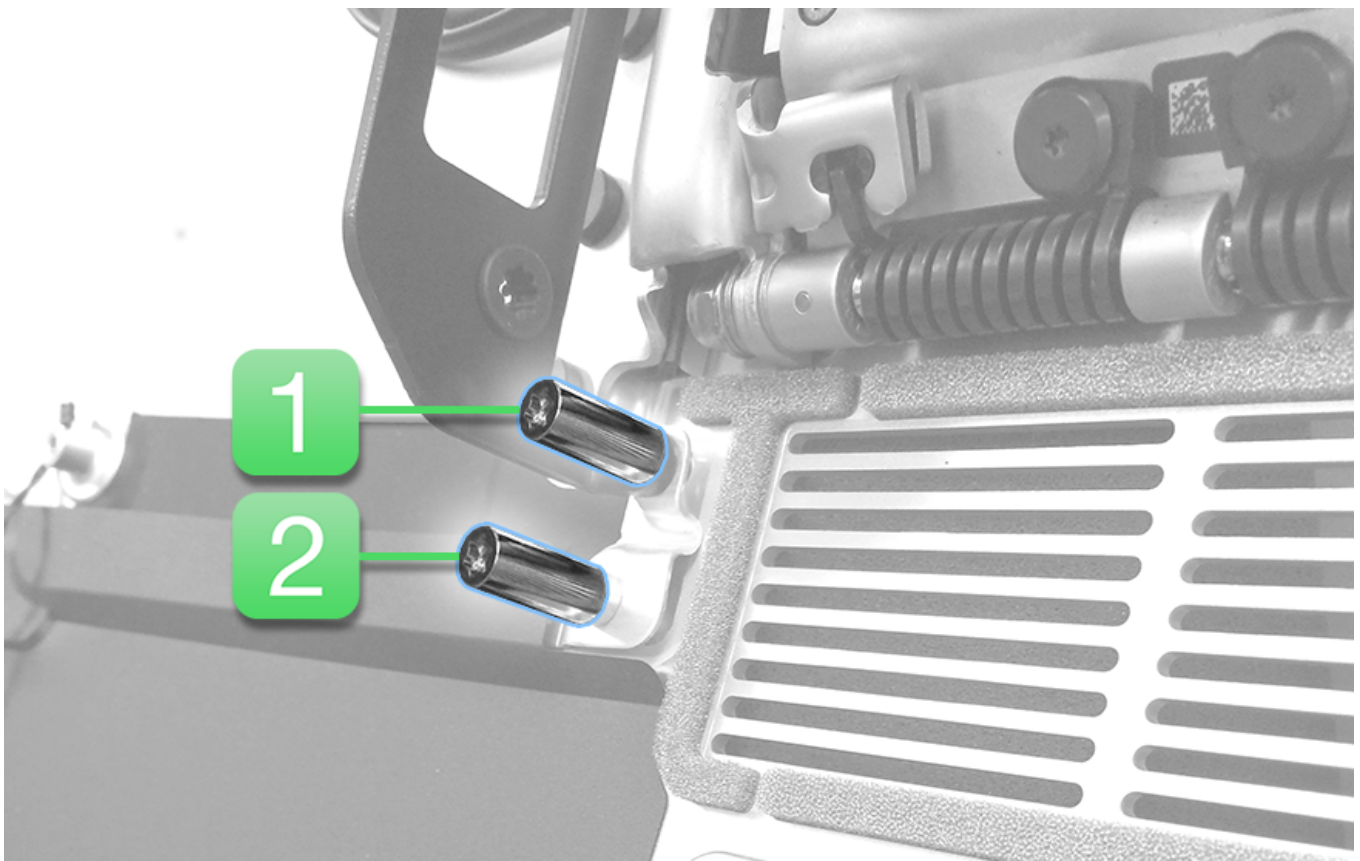
- Mechanism
 - Mechanism (923-0313), for iMac (Late 2012 and Late 2013) with hard drives
 - Mechanism (923-0376), for iMac (Late 2012 and Late 2013) without hard drives
 - Mechanism (923-00085), for iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)
 - Mechanism (923-00655), for iMac (Retina 5K, 27-inch, Late 2015)
- Mechanism screws (923-0334)
- RAM access door (923-0554)
- RAM access door lock mechanism (923-0553), Late 2012 to Mid 2015
- RAM access door lock mechanism (923-00658), Late 2015
- RAM access door lock mechanism screws (923-0404)
- 9-hole chin strap (923-0528)
- Chin strap screws (923-0338), package of 9
- T25 PSU standoff (923-0520), available only with rear housing (923-0522)
- T25 PSU standoff (923-0399), available only with rear housing (923-00082) and rear housing (923-00651)
- T25 HDD standoff (923-0521), available only with rear housing (923-0522)
- T25 HDD standoff (923-00097), available only with rear housing (923-00082) and rear housing (923-00651)

The rear housing includes the following parts, which are **not** available separately:

- Wi-Fi antenna (in silver circle behind Apple logo)
- Microphone
- Power button and cable
- Audio input/output cable
- AC inlet
- Gaskets
- Wireless antenna insulator tape

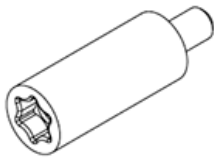
Steps For Reassembly

1. If you are replacing a rear housing on an iMac that has a 9-hole rear housing, transfer standoffs (#1 and #2) **and** the left and right hard drive brackets (black, metal brackets that support the hard drive) to the replacement rear housing, then proceed to step 3. **Note:** Standoff #1 secures the right hard drive bracket to the rear housing, as shown below.



2. If you are replacing a rear housing on an iMac that has a 5-hole rear housing (923-0378), order the 9-hole rear housing (923-0522) and do the following:

- Dispose of the two longer standoffs used on the 5-hole rear housing. **Note:** The 5-hole standoffs will damage the 9-hole rear housing if installed.
- Transfer the RAM door from the 5-hole rear housing to the 9-hole rear housing. The RAM installation graphics on the door are specific to the Late 2012 model.
- Install the 9-hole chin strap and nine new chin strap screws. Dispose of the chin strap screws used on the 5-hole rear housing.
- Transfer the left and right hard drive brackets.
- Install new hard drive standoff #1 (923-0521), included with the 9-hole rear housing, to the lower screw hole on the right hard drive bracket. Refer to standoff #1 in the graphic below.



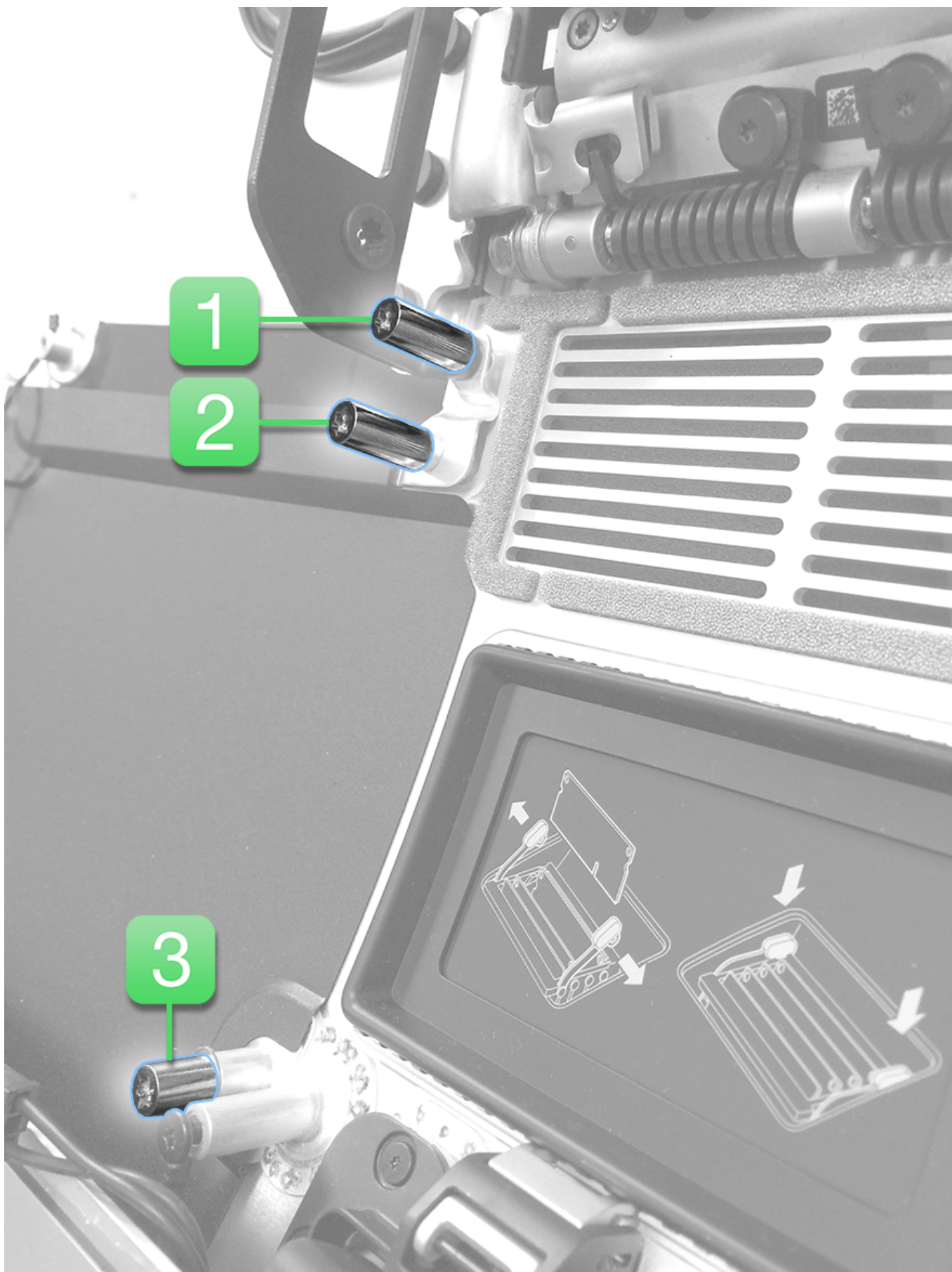
- Install new power supply standoff #2 (923-0520), included with the 9-hole rear housing, to the rear housing. Refer to standoff #2 in the graphic below.



- Transfer the shorter, power supply standoff #3 (923-0399) from the 5-hole rear housing to the 9-hole rear housing. Refer to standoff #3 in the graphic below.



Tip: If you have to step away from the repair, screw the standoffs to the rear housing so they don't get lost or mixed up on the repair bench.



3. Transfer the Bluetooth antenna (upper antenna), two Wi-Fi antennas (middle and lower antennas), and insulator tape (which secures the antennas) to the rear housing.

4. Route the antennas under the insulator tape or Mylar tape. **Note:** If the insulator tape or Mylar tape no longer adheres to the rear housing, use Kapton tape to secure the antennas.

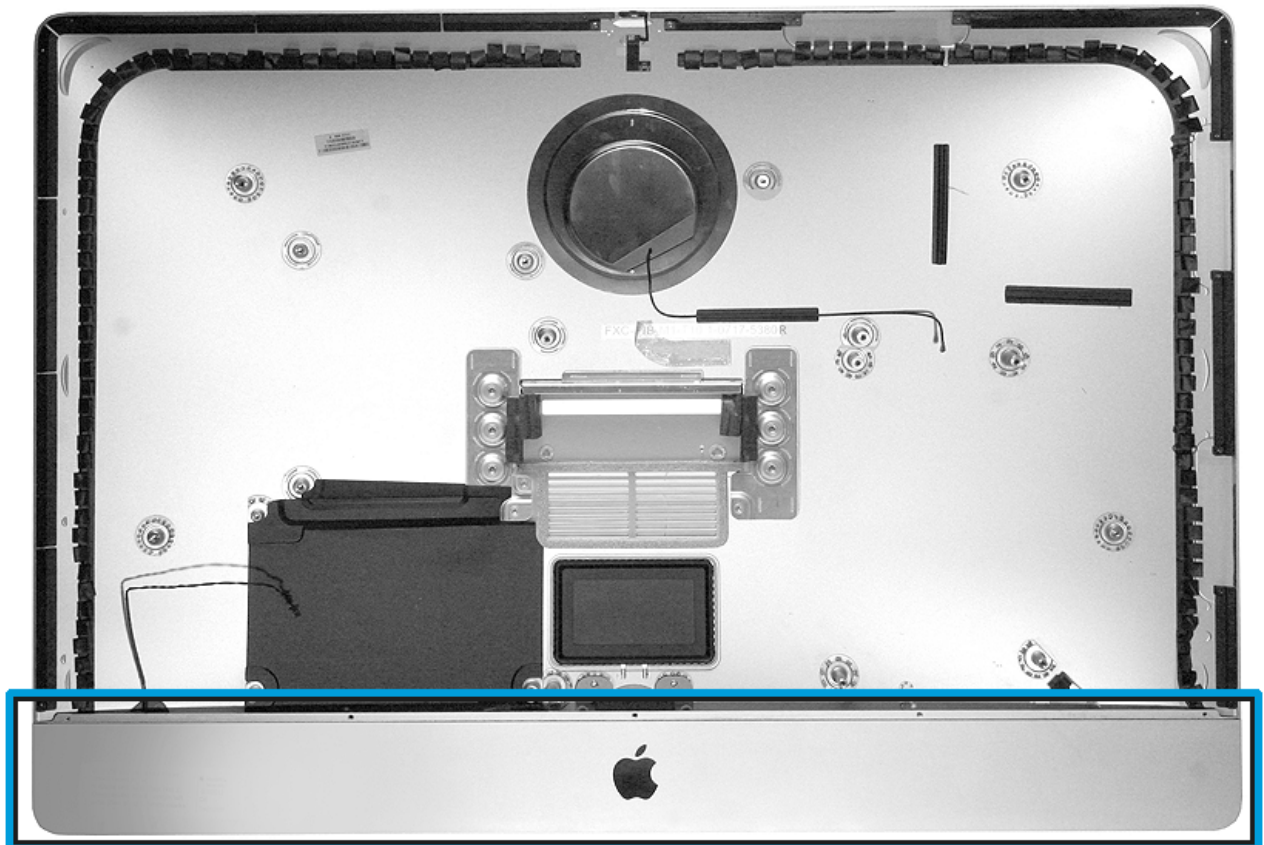
5. Reinstall the remaining modules:

- [Stand](#)

- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)
- [Power supply](#)
- [Hard drive](#)
- [Left speaker](#)
- [Right speaker](#)
- [Chin strap](#)
- [Camera/microphone cable](#)
- [Camera](#)
- [Fan](#)
- [Display panel VHB strips](#)
- [Display panel](#)

Handling the Rear Housing

Always handle the rear housing with two hands in the lower left and right corners. Never carry the rear housing with a single hand, or by holding the aluminum chin (where the Apple logo appears on the lower front).



VESA Mount Adapter

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

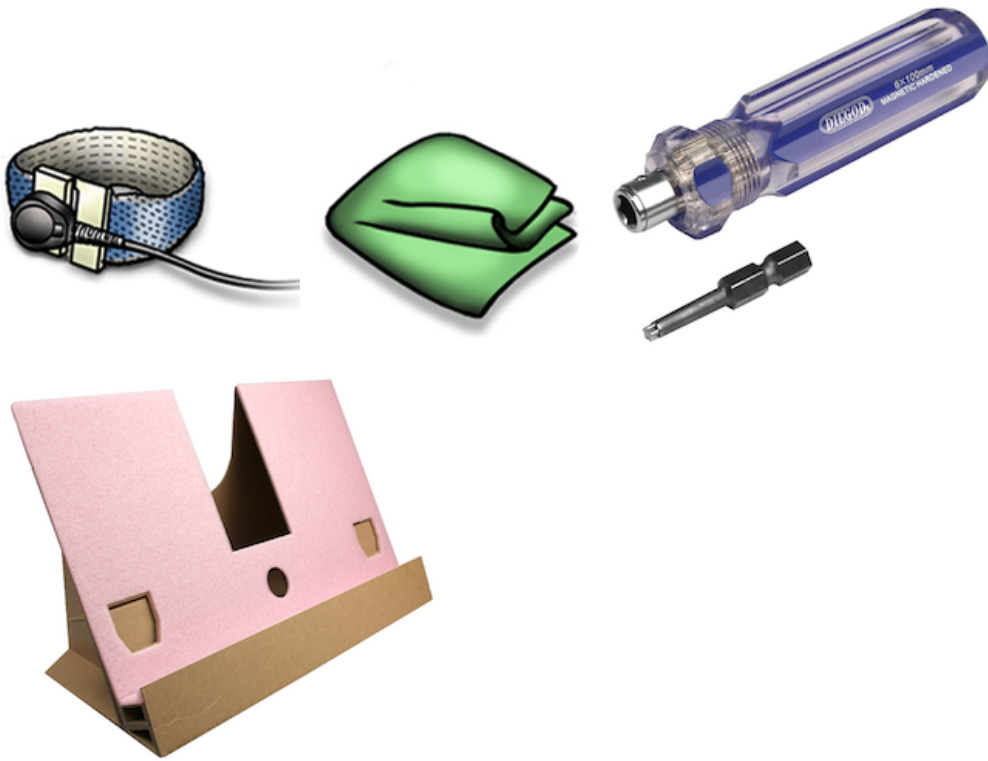
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Camera cable \(disconnect from logic board\)](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Disconnect Bluetooth antenna](#) (Late 2012 to Mid 2015)
- [Disconnect Bluetooth antenna](#) (Late 2015)
- [Disconnect middle Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Disconnect middle Wi-Fi antenna](#) (Late 2015)
- [Disconnect lower Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Disconnect lower Wi-Fi antenna](#) (Late 2015)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)



Tools

- ESD wrist strap and mat
- Lint-free cloth
- VESA pentalobe driver (923-0367)
- LCD Service Support Stand (923-0416)

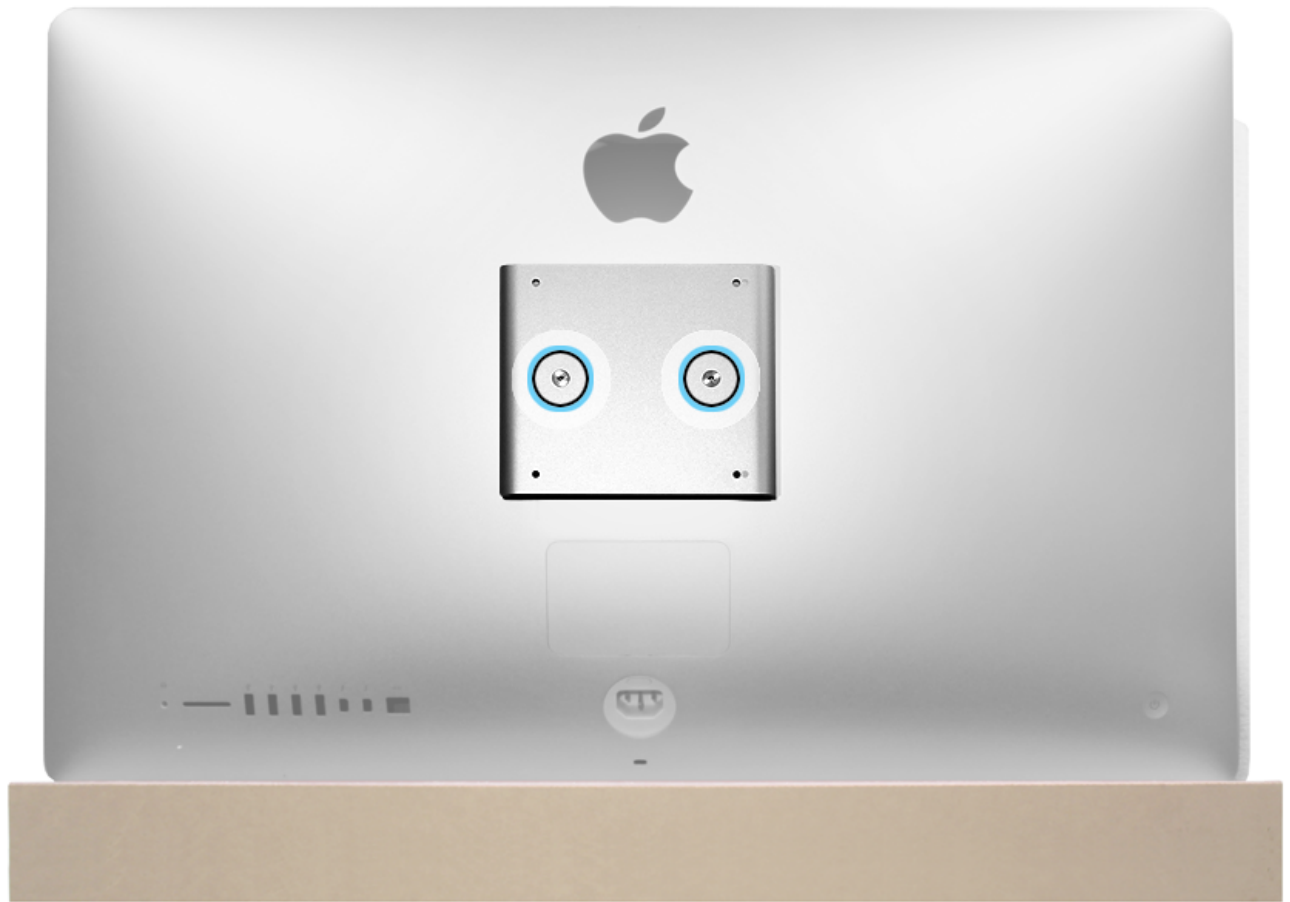


Steps For Removal

1. Place rear housing on LCD support stand, with the VESA mount adapter facing you.
2. Remove two pentalobe screws.
 - 923-0418

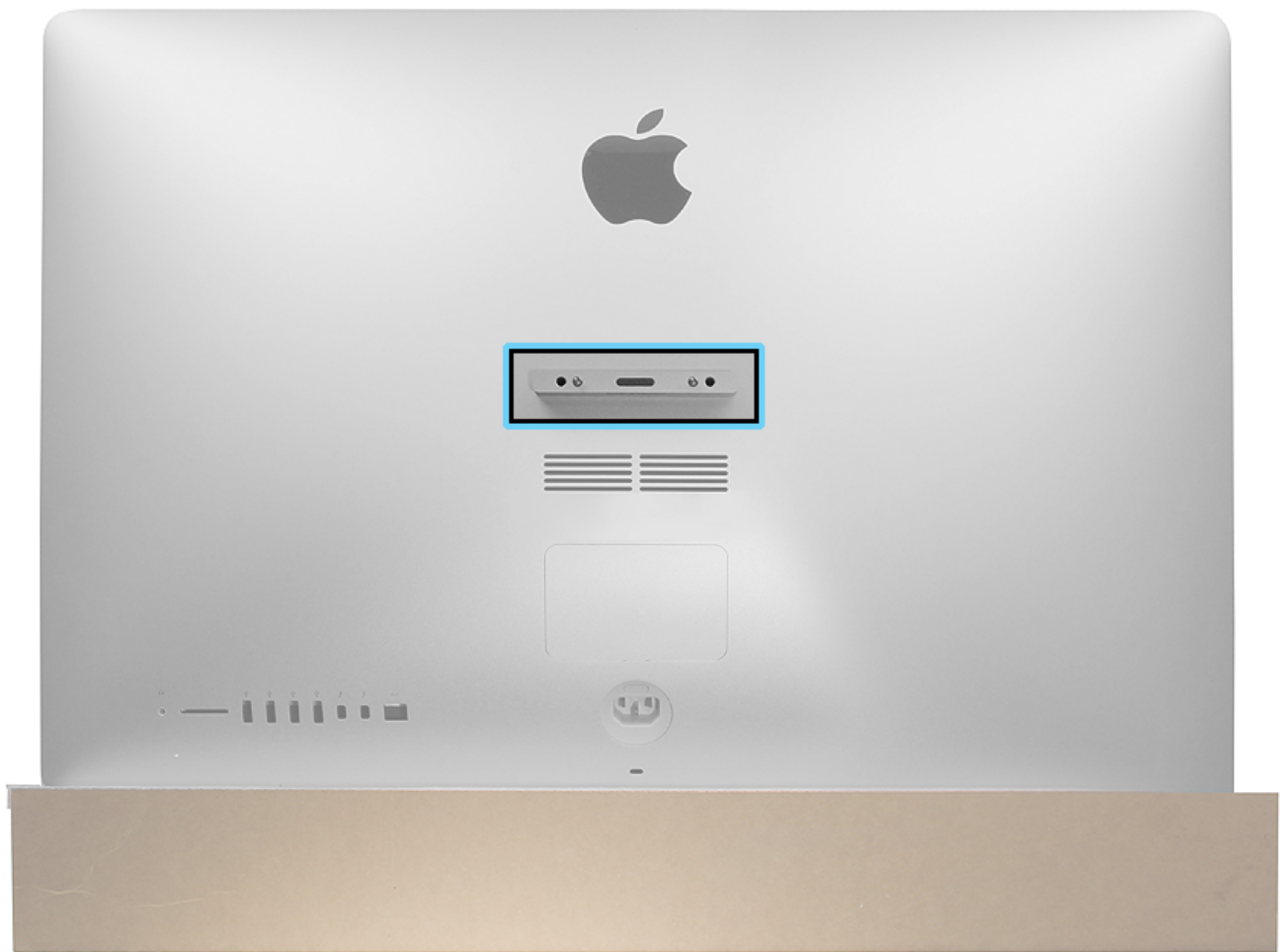


3. Lift the VESA mount adapter off the rear housing.



Steps For Reassembly

1. Insert the VESA tongue into the opening on the rear housing (if removed).

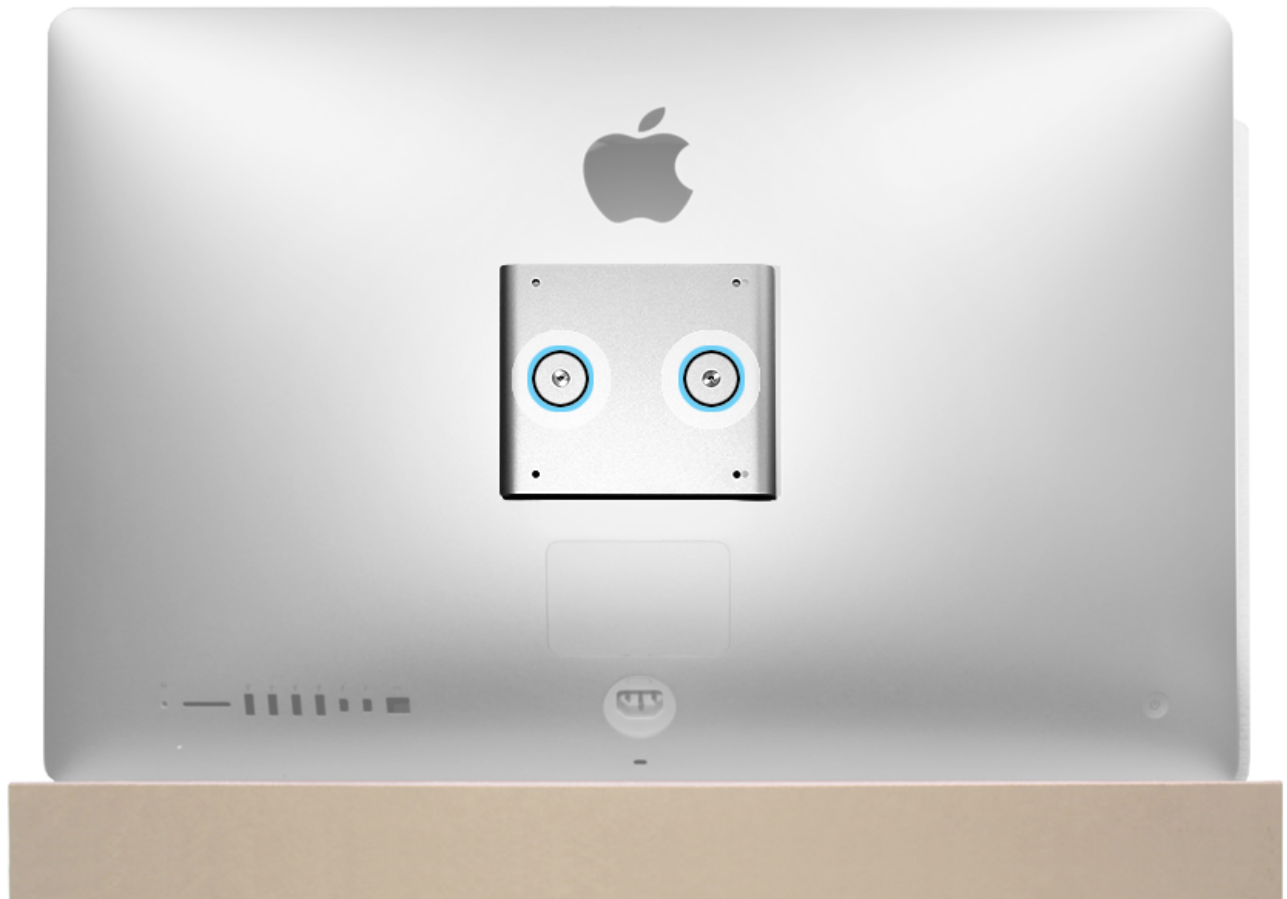


2. Place the VESA mount adapter over the VESA tongue, lining up the screw holes.

3. Install two pentalobe screws.

- 923-0418





4. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
5. Reinstall the [power supply](#).
6. Connect the lower Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
7. Connect the middle Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
8. Connect the upper Bluetooth antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
9. Reinstall the [hard drive](#).
10. Reinstall the [left speaker](#).
11. Reinstall the [right speaker](#).
12. Reinstall the [chin strap](#).
13. Connect the [camera cable](#) to the logic board.
14. Reinstall the [fan](#).
15. Install new [display panel VHB strips](#).
16. Reinstall the [display panel](#).

VESA Tongue

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

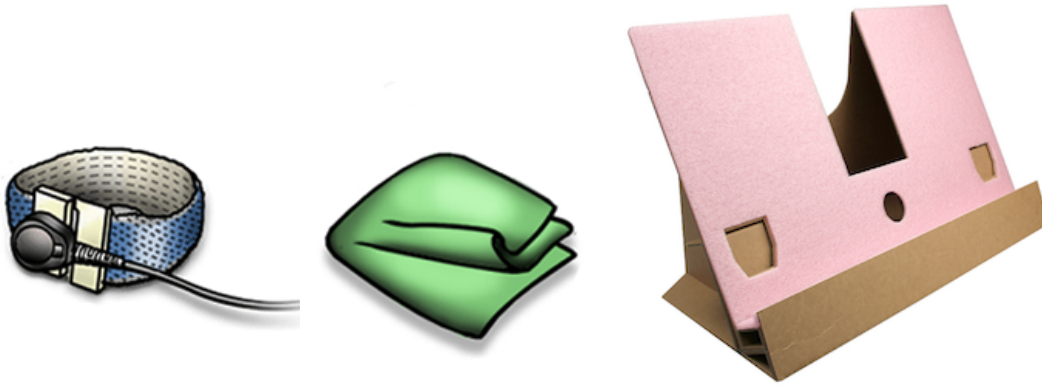
Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Camera cable \(disconnect from logic board\)](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Disconnect Bluetooth antenna \(upper\)](#) (Late 2012 to Mid 2015)
- [Disconnect Bluetooth antenna \(upper\)](#) (Late 2015)
- [Disconnect Wi-Fi antenna \(mid\)](#) (Late 2012 to Mid 2015)
- [Disconnect Wi-Fi antenna \(mid\)](#) (Late 2015)
- [Disconnect Wi-Fi antenna \(lower\)](#) (Late 2012 to Mid 2015)
- [Disconnect Wi-Fi antenna \(lower\)](#) (Late 2015)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)
- [VESA mount adapter](#)



Tools

- ESD wrist strap and mat
- Lint-free cloth
- LCD Service Support Stand (923-0416)

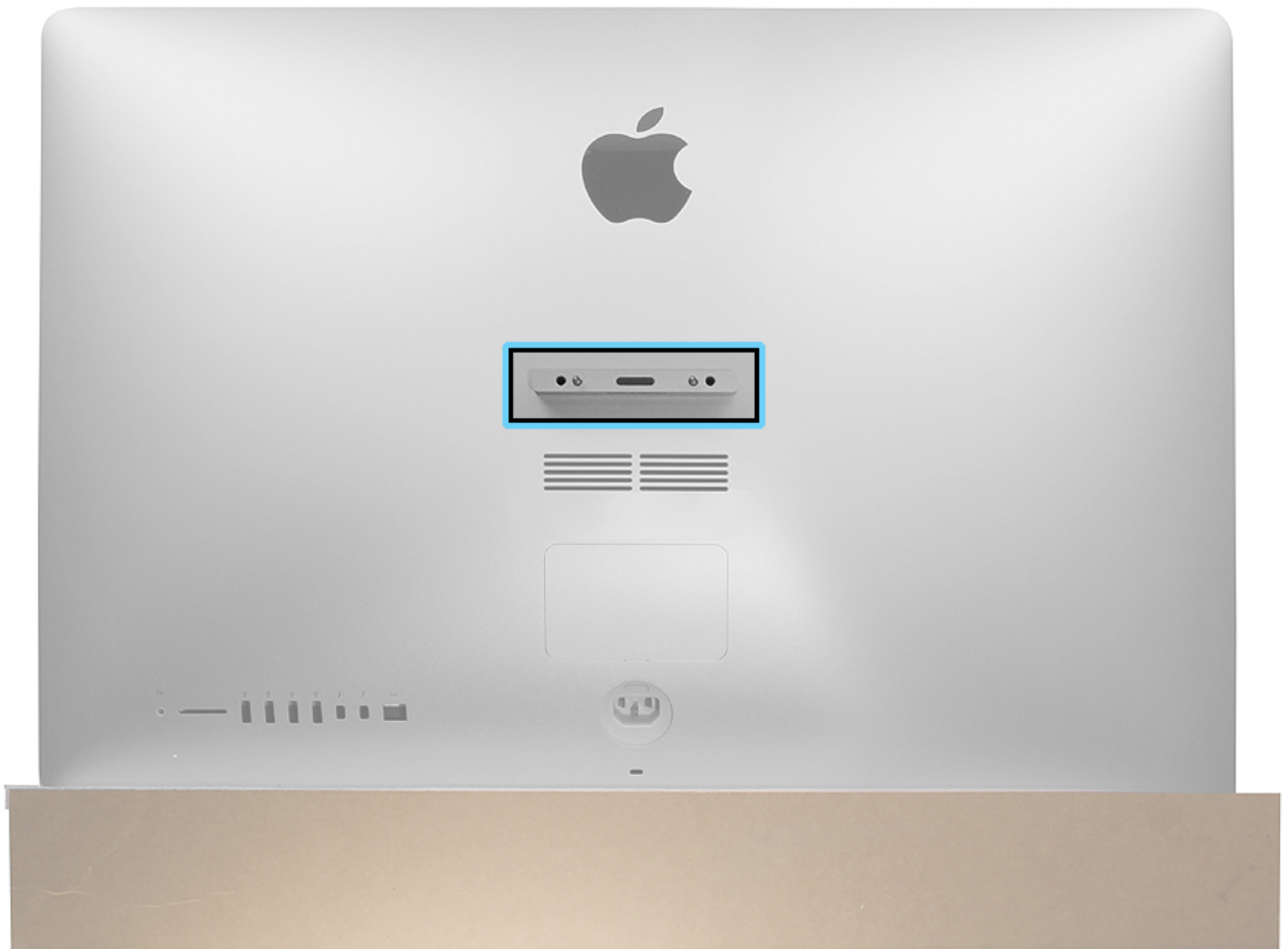


Steps For Removal

1. Place the rear housing on the LCD support stand, with the VESA tongue facing you.
2. Pull the VESA tongue off of the rear housing. **Note:** The computer serial number is on the underside of the VESA tongue.

Steps For Reassembly

1. Insert the VESA tongue into the opening on the rear housing.



2. Reinstall the [VESA mount adapter](#).
3. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
4. Reinstall the [power supply](#).
5. Connect the lower Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
6. Connect the middle Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.

7. Connect the upper Bluetooth antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
8. Reinstall the [hard drive](#).
9. Reinstall the [left speaker](#).
10. Reinstall the [right speaker](#).
11. Reinstall the [chin strap](#).
12. Connect the [camera cable](#) to the logic board.
13. Reinstall the [fan](#).
14. Install new [display panel VHB strips](#).
15. Reinstall the [display panel](#).

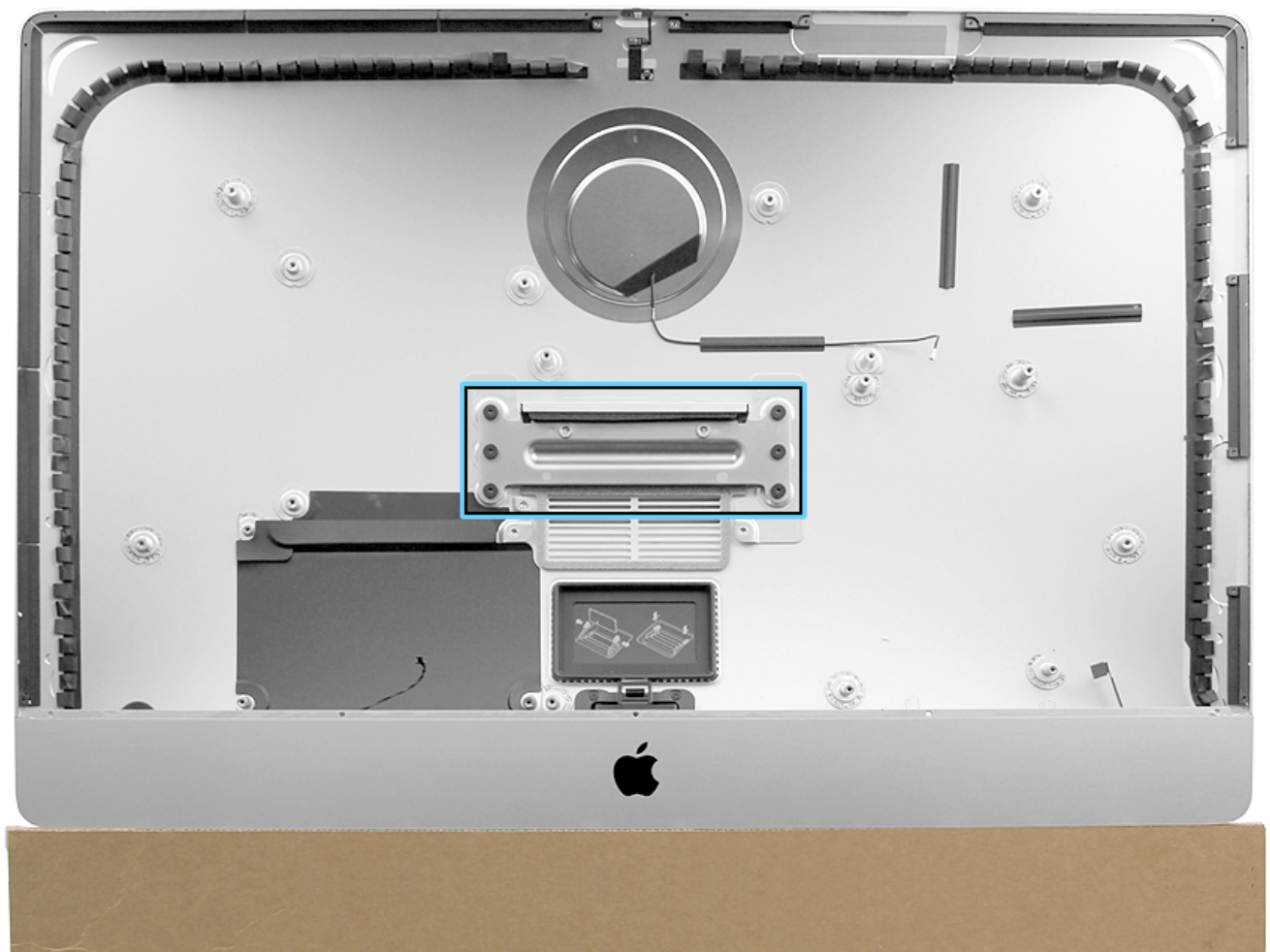
VESA Mechanism Plate

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

Remove:

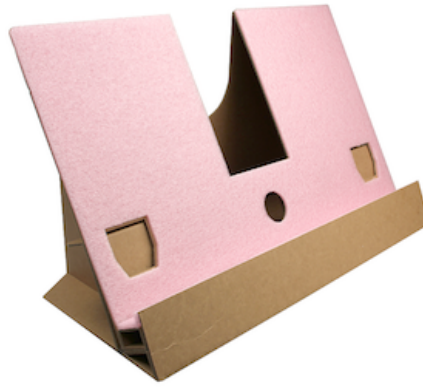
- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Camera cable \(disconnect from logic board\)](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Bluetooth antenna](#) (Late 2012 to Mid 2015)
- [Bluetooth antenna](#) (Late 2015)
- [Middle Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Middle Wi-Fi antenna](#) (Late 2015)
- [Lower Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Lower Wi-Fi antenna](#) (Late 2015)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)
- [VESA mount adapter](#)
- [VESA tongue](#)



Tools

- ESD wrist strap and mat
- Lint-free cloth

- LCD service support stand (923-0416)
- Torx T10 screwdriver



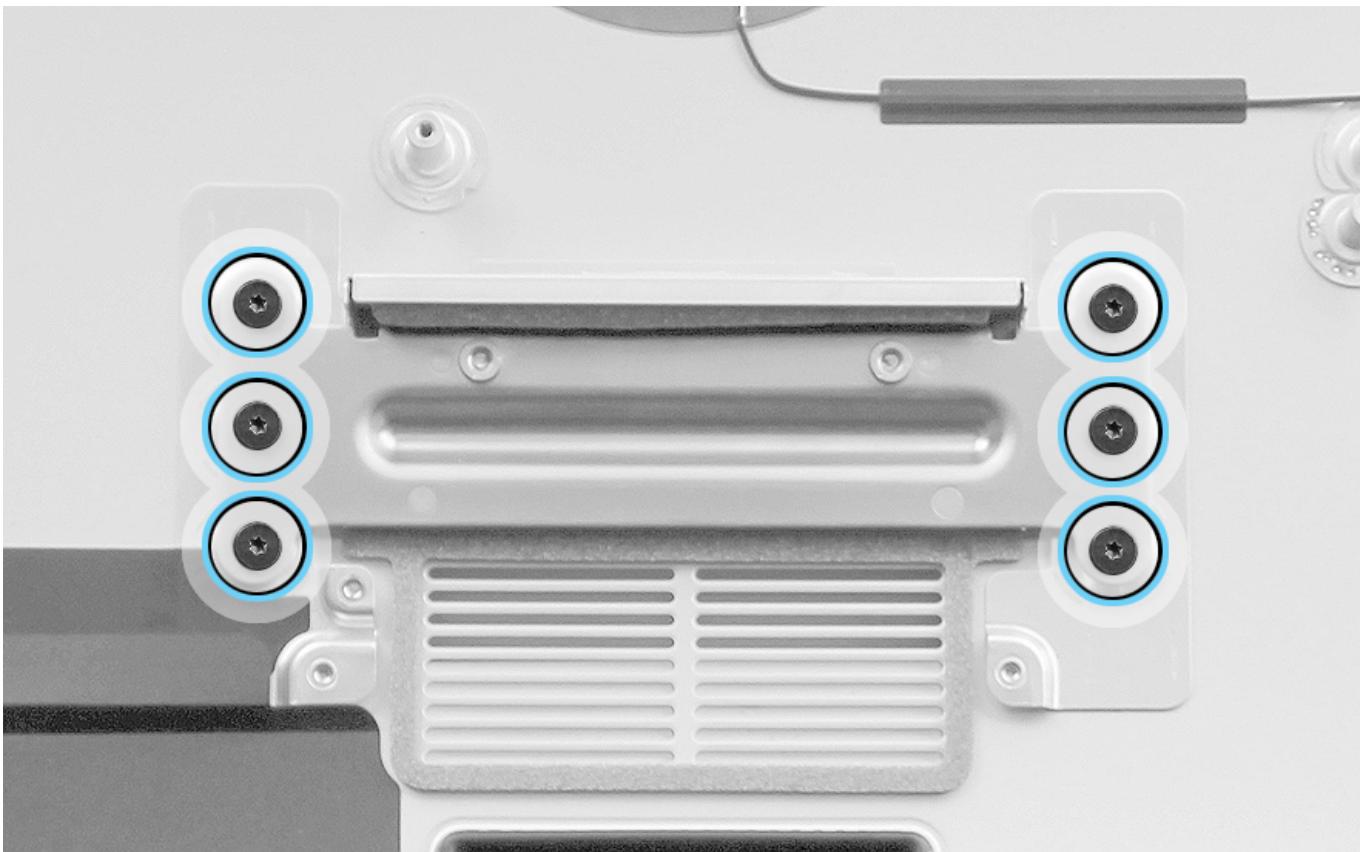
Steps For Removal

1. Place the rear housing on the LCD support stand, with the VESA mechanism plate facing you.
2. Remove six T10 screws.

- 923-0334



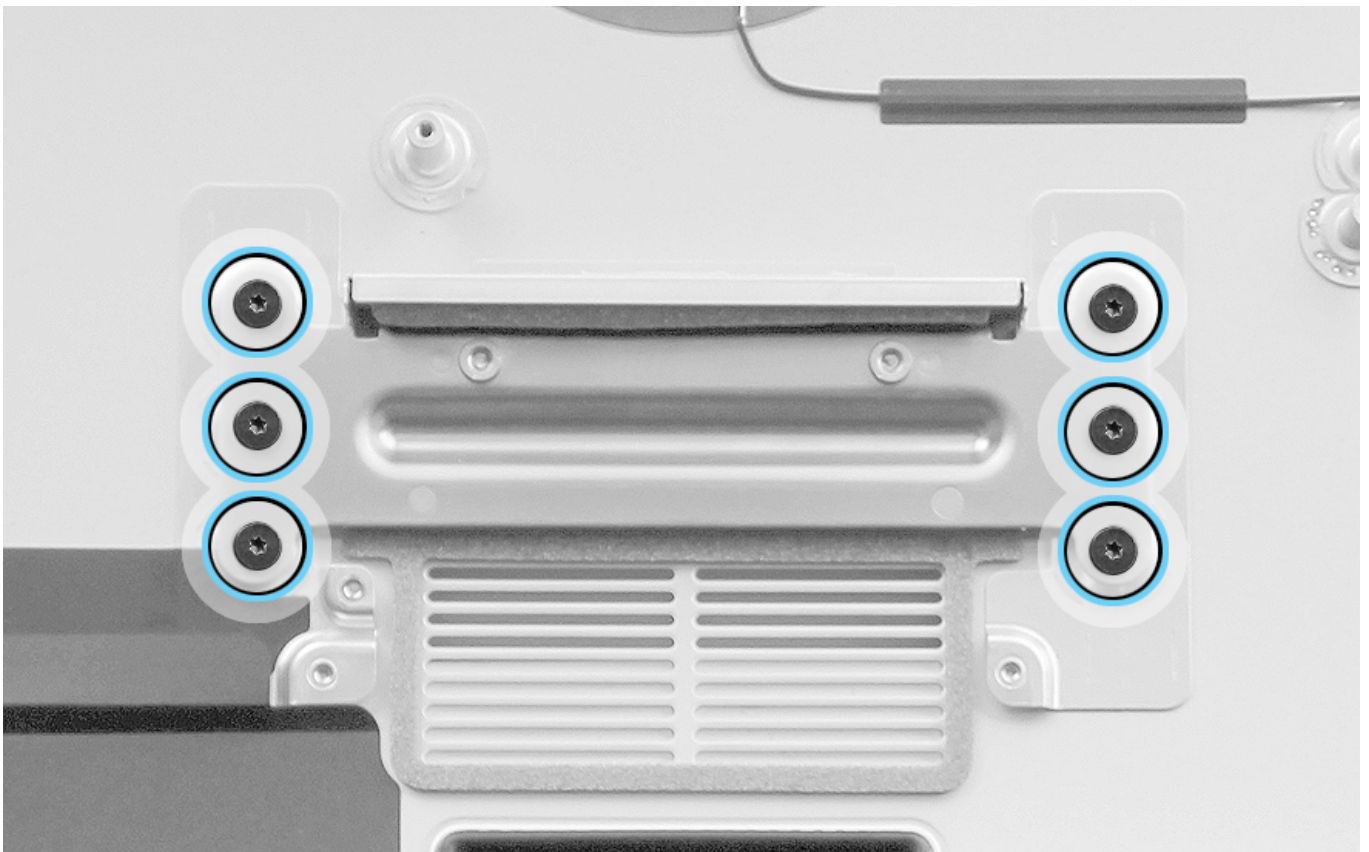
3. Lift the VESA mechanism plate off of the rear housing.



Steps For Reassembly

1. Position the mechanism plate in the rear housing.
2. Reinstall the six T10 screws.
 - 923-0334





3. Reinstall the [VESA tongue](#).
4. Reinstall the [VESA mount adapter](#).
5. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
6. Reinstall the [power supply](#).
7. Connect the lower Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
8. Connect the middle Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
9. Connect the upper Bluetooth antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
10. Reinstall the [hard drive](#).
11. Reinstall the [left speaker](#).
12. Reinstall the [right speaker](#).
13. Reinstall the [chin strap](#).
14. Connect the [camera cable](#) to the logic board.
15. Reinstall the [fan](#).
16. Install new [display panel VHB strips](#).
17. Reinstall the [display panel](#).

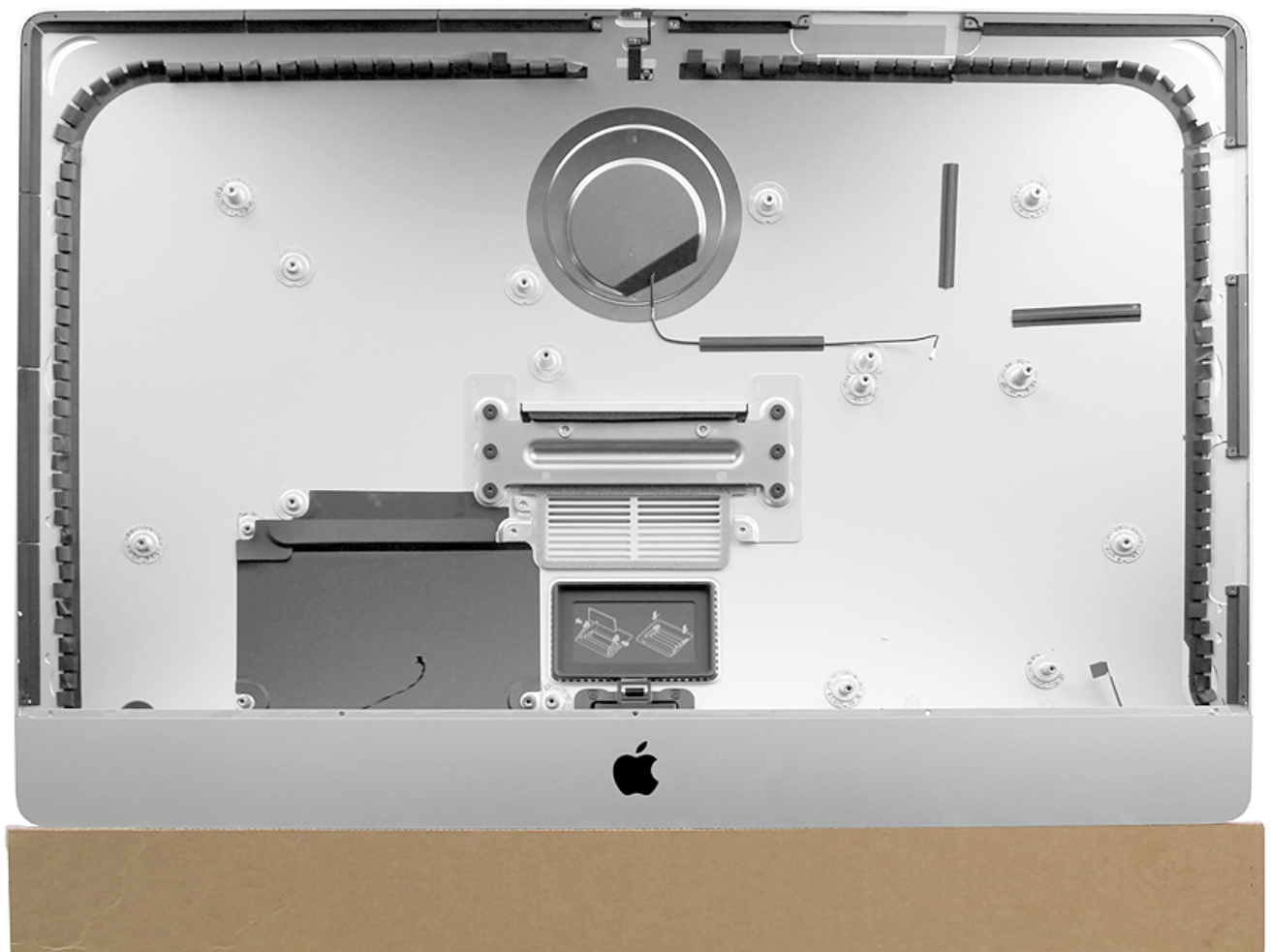
VESA Rear Housing

First Steps

Important: This procedure should only be performed by Apple-certified technicians. For more information, refer to article [HT202594: Exams for Service Technicians](#).

Remove:

- [Display panel](#)
- [Display panel VHB strips](#)
- [Fan](#)
- [Camera](#)
- [Camera cable \(disconnect from logic board\)](#)
- [Chin strap](#)
- [Right speaker](#)
- [Left speaker](#)
- [Hard drive](#)
- [Bluetooth antenna](#) (Late 2012 to Mid 2015)
- [Bluetooth antenna](#) (Late 2015)
- [Middle Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Middle Wi-Fi antenna](#) (Late 2015)
- [Lower Wi-Fi antenna](#) (Late 2012 to Mid 2015)
- [Lower Wi-Fi antenna](#) (Late 2015)
- [Power supply](#)
- [Logic board](#) (Late 2012 to Mid 2015)
- [Logic board](#) (Late 2015)
- [VESA mount adapter](#)
- [VESA tongue](#)



Tools

- ESD wrist strap and mat

- Lint-free cloth
- LCD service support stand (923-0416)
- Torx T10 screwdriver
- Torx T8 screwdriver
- Torx T4 screwdriver



Steps For Removal

1. Place the computer on the LCD service support stand to remove all modules listed above.
2. With all modules removed, the rear housing is the remaining part.
 - 923-0552: VESA rear housing for Late 2012 and Late 2013 models. **Note:** The original VESA rear housing 923-0426, which has five screw holes on the chin (see below), was replaced by VESA rear housing (923-0552), which has nine screw holes on the chin.
 - 923-00082: VESA rear housing for iMac (Retina 5K, 27-inch, Late 2014 and Mid 2015)
 - 923-00651: VESA rear housing for iMac (Retina 5K, 27-inch, Late 2015)

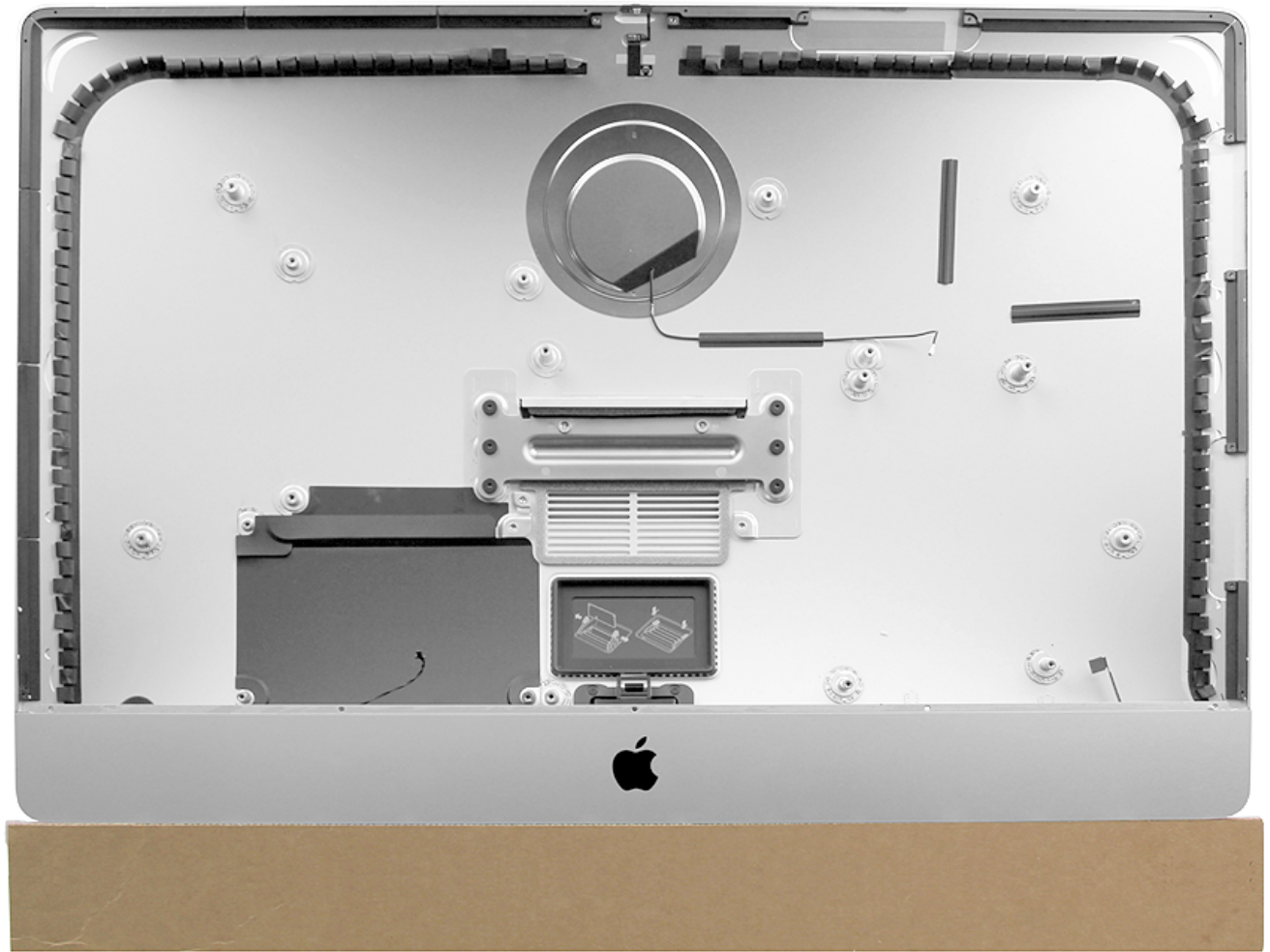
A VESA rear housing includes the following parts, which are **not** available separately:

- Wi-Fi antenna in silver circle behind Apple logo
- microphone
- power button and cable
- AC inlet
- audio input/output cable
- gaskets
- wireless antenna insulators

A VESA rear housing includes the following parts, which are available separately:

- RAM access door (923-0554)
- RAM access door lock mechanism (923-0553)
- RAM access door lock mechanism screws (923-0404)
- VESA mechanism plate (923-0532)
- VESA mechanism plate (923-00657) Late 2015 only
- VESA mechanism plate screws (923-0334)
- VESA screws (923-0418)
- 9-hole chin strap (923-0528)
- 9 chin strap screws (923-0338)
- T25 PSU standoff (923-0520), use only with 9-hole chin strap / rear housing (923-0552)
- T25 HDD standoff (923-0521), use only with 9-hole chin strap / rear housing (923-0552)

Original VESA Rear Housing (923-0426 - 5 holes for chin strap)



Steps For Reassembly

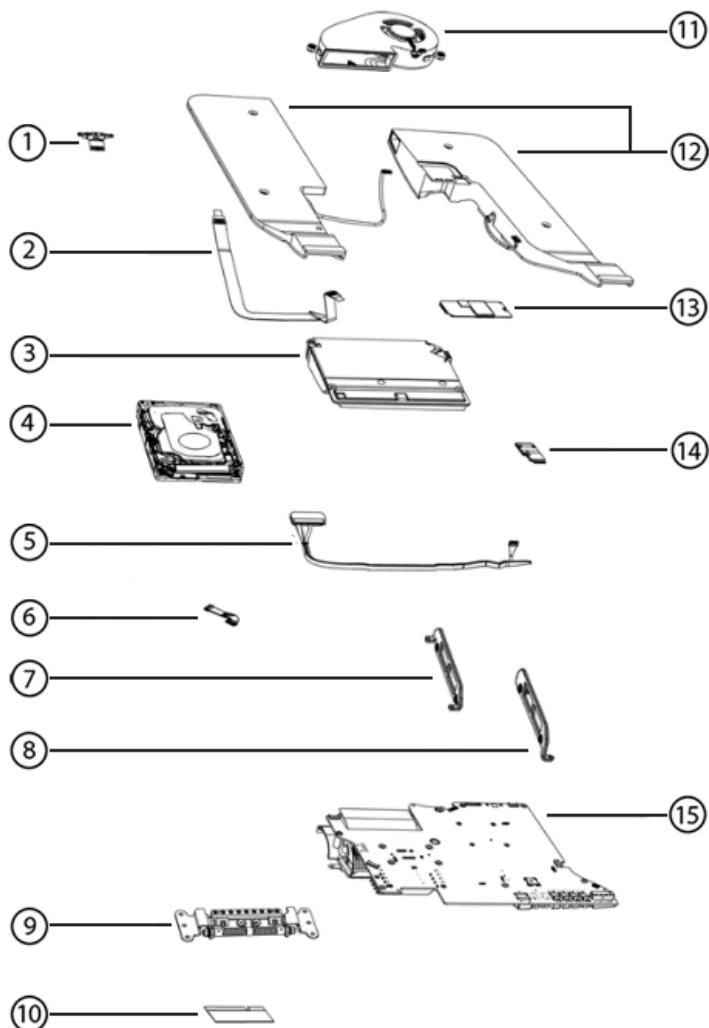
Caution: Always handle the rear housing with two hands in the lower left and right corners. Handling the rear housing incorrectly could flex the aluminum and cause alignment issues. Never carry the rear housing with a single hand and do not push in or pull out on the chin.

1. Transfer the Bluetooth and Wi-Fi antennas to the rear housing.
2. Press the Mylar tape on the Bluetooth and Wi-Fi antennas onto the rear housing.
3. Transfer the hard drive brackets.
4. Transfer the VESA mount adapter and VESA tongue.
5. Reinstall the logic board for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
6. Reinstall the [power supply](#).
7. Connect the lower Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
8. Connect the middle Wi-Fi antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
9. Connect the upper Bluetooth antenna for [Late 2012 to Mid 2015](#) models, or for the [Late 2015](#) model.
10. Reinstall the [hard drive](#).
11. Reinstall the [left speaker](#).
12. Reinstall the [right speaker](#).
13. Reinstall the [chin strap](#).
14. Reinstall the [camera](#).
15. Connect both ends of the [camera/microphone cable](#).
16. Reinstall the [fan](#).
17. Install new [display panel VHB strips](#).
18. Reinstall the [display panel](#).

Exploded Views

Exploded Views for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

Exploded View 1



1. Camera

- 923-0301 (Late 2012)
- 923-0524 (Late 2013)
- 923-00088 (Late 2014, Mid 2015)
- 923-00661 (Late 2015)

2. Cable, Camera/Microphone

- 923-0307 (Late 2012)
- 923-0530 (Late 2013)
- 923-00091 (Late 2014, Mid 2015, Late 2015)

3. Power Supply, 300W

- 661-7170 (Late 2012)
- 661-7886 (Late 2013, Late 2014, Mid 2015)
- 661-03524 (Late 2015)

4. Hard Drive

- 661-7164, 1TB (Late 2012)
- 661-7165, 3TB (Late 2012)
- 661-7877, 1TB (Late 2013)
- 661-7876, 3TB (Late 2013)

- 661-00195, 1TB (Late 2014, Mid 2015)
- 661-00196, 3TB (Late 2014, Mid 2015)
- 661-03284, 1TB (Late 2015)
- 661-03285, 2TB (Late 2015)
- 661-03286, 3TB (Late 2015)

5. Hard Drive Data and Power Cable

- 923-0312 (Late 2012)
- 923-0519 (Late 2013)
- 923-00092 (Late 2014, Mid 2015)
- 923-00664 (Late 2015)

6. PSU Signal Cable

- 923-0311

7. Hard Drive Carrier Frame, Left

- 923-00086 (Late 2014, Mid 2015, Late 2015)

8. Hard Drive Carrier Frame, Right

- 923-00087 (Late 2014, Mid 2015, Late 2015)

9. Mechanism

- 923-0313 (for units with a hard drive)
- 923-0376 (for units without a hard drive)
- 923-00085 (Late 2014, Mid 2015)
- 923-00655 (Late 2015)

10. Memory, SDRAM (Late 2012)

- 661-7161, 4GB, DDR3 (Late 2012)
- 661-7162, 8GB, DDR3 (Late 2012)
- 661-7883, 4GB, DDR3 (Late 2013)
- 661-7884, 8GB, DDR3 (Late 2013)
- 661-00149, 4GB, DDR3 (Late 2014, Mid 2015)
- 661-00150, 8GB, DDR3 (Late 2014, Mid 2015)
- 661-03253, 4GB, DDR3 (Late 2015)
- 661-03254, 8GB, DDR3 (Late 2015)

11. Fan

- 923-0302 (Late 2012, Late 2013)
- 923-00089 (Late 2014, Mid 2015, Late 2015)

12. Speaker, Pair, Left and Right

- 923-0300 (Late 2012)
- 923-0523 (Late 2013)
- 923-00090 (Late 2014, Mid 2015)
- 923-00663 (Late 2015)

13. Flash Storage

- 661-7166, 128GB (Late 2012, Late 2013)
- 661-7167, 768GB (Late 2012, Late 2013)
- 661-7878, 1TB (Late 2013)
- 661-01724, 128GB, UAX, (Late 2014, Mid 2015)
- 661-01725, 256GB, UAX, (Late 2014, Mid 2015)
- 661-00198, 512GB, UAX, (Late 2014, Mid 2015)
- 661-00199, 1TB, UAX, (Late 2014, Mid 2015)
- 661-02756, 128GB, UBX, (Late 2013, Late 2014, Mid 2015)
- 661-02757, 256GB, UBX, (Late 2013, Late 2014, Mid 2015)
- 661-02758, 512GB, UBX, (Late 2013, Late 2014, Mid 2015)
- 661-02759, 1TB, UBX, (Late 2013, Late 2014, Mid 2015)
- 661-03563, 1TB (Late 2015)
- 661-03561, 256GB (Late 2015)
- 661-03562, 512GB (Late 2015)
- 661-03526, 32GB (Late 2015, Fusion)

- 661-03570, 128GB (Late 2015)

14. Wireless Card

- 661-7110, Americas (Late 2012, Late 2013)
- B661-7110, Great Britain (Late 2012, Late 2013)
- J661-7110, Japan (Late 2012, Late 2013)
- KH661-7110, Korean (Late 2012, Late 2013)
- PA661-7110, Asia PAC (Late 2012, Late 2013)
- Z661-7110, International (Late 2012, Late 2013)
- 661-7514, Americas (Late 2014, Mid 2015)
- ZP661-7514, English Singapore (Late 2014, Mid 2015)
- Z661-7514, English International (Late 2014, Mid 2015)
- J661-7514, Japan (Late 2014, Mid 2015)
- 661-02893 (Late 2015)

Note: Use the country prefix in front of the part number to indicate correct country, for example: B - Great Britain; ID - India; J - Japan; KH - Korea; PA - Asia Pacific; Z - English International; ZM - Multilingual; ZP - English Singapore.

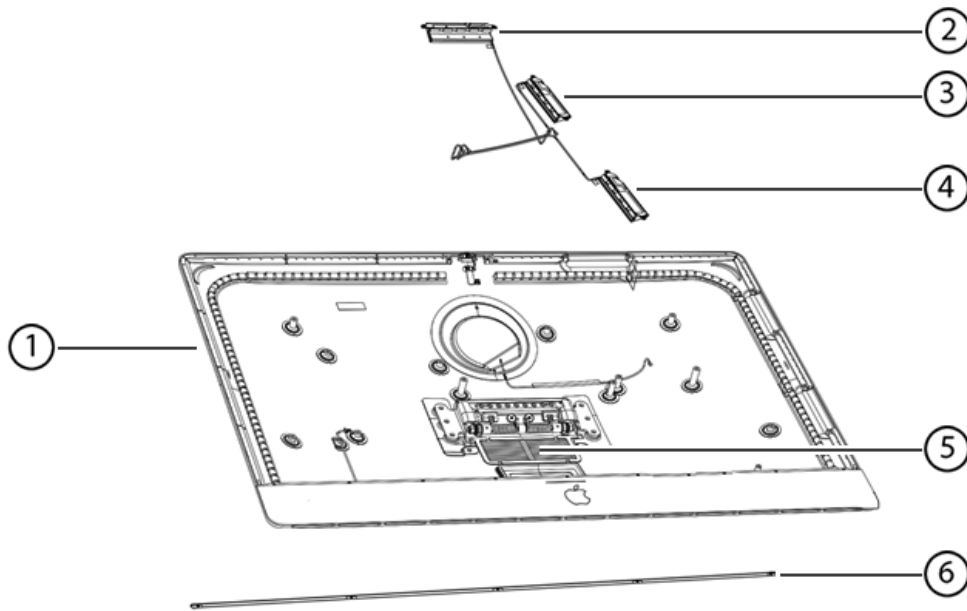
15. Logic Board

- 661-7156, 2.9GHz, i5, 512MB (Late 2012)
- 661-7157, 3.2GHz, i5, 1GB (Late 2012)
- 661-7158, 3.4GHz, i5, 2GB (Late 2012)
- 661-7159, 3.4GHz, i7, 1GB (Late 2012)
- 661-7160, 3.4GHz, i7, 2GB (Late 2012)
- 661-7516, 3.2GHz, i5, 1GB (Late 2013)
- 661-7517, 3.4GHz, i5, 2GB (Late 2013)
- 661-7518, 3.4GHz, i5, 4GB (Late 2013)
- 661-8123, 3.5GHz, i7, 2GB (Late 2013)
- 661-8124, 3.5GHz, i7, 4GB (Late 2013)
- 661-00190, 3.3GHz, i7, 2GB (Late 2014, Mid 2015)
- 661-00191, 3.5GHz, i5, 2GB (Late 2014, Mid 2015)
- 661-00192, 3.5GHz, i5, 4GB (Late 2014, Mid 2015)
- 661-00193, 4.0GHz, i7, 2GB (Late 2014, Mid 2015)
- 661-00194, 4.0GHz, i7, 4GB (Late 2014, Mid 2015)
- 661-03169, 3.2GHz, i5, 2GB (Late 2015)
- 661-03170, 3.2GHz, i5, 2GB (Late 2015)
- 661-03171, 3.3GHz, i5, 4GB (Late 2015)
- 661-03172, 4.0GHz, i7, 4GB (Late 2015)
- 661-03173, 4.0GHz, i7, 4GB (Late 2015)
- 661-03174, 4.0GHz, i7, 2GB (Late 2015)
- 661-03175, 3.3GHz, i5, 2GB (Late 2015)

Not shown:

Kit, Thermal Pad, Wireless Card, 076-1445

Exploded View 2



1. Rear Housing

- 923-0522 (Late 2012, Late 2013)
- 923-00081 (Late 2014, Mid 2015)
- 923-0426, VESA (Late 2012)
- 923-0552, VESA (Late 2013)
- 923-00082, VESA (Late 2014, Mid 2015)
- 923-00651, VESA (Late 2015)
- 923-00650 (Late 2015)

2. Bluetooth Antenna

- 923-0303 (Late 2012)
- 923-0525 (Late 2013)
- 923-00094 (Late 2014, Mid 2015)
- 923-00665 (Late 2015)

3. Middle Wi-Fi Antenna

- 923-0305 (Late 2012)
- 923-0526 (Late 2013)
- 923-00095 (Late 2014, Mid 2015)
- 923-00667 (Late 2015)

4. Lower Wi-Fi Antenna

- 923-0306 (Late 2012)
- 923-0527 (Late 2013)
- 923-00096 (Late 2014, Mid 2015)
- 923-00668 (Late 2015)

5. RAM Door

- 923-0403 (Late 2013)
- 923-0554 (Late 2013, Late 2014, Mid 2015, Late 2015)

6. Chin Strap

- 923-0368, 5-hole (Late 2012)
- 923-0528, 9-hole (Late 2013, Late 2014, Mid 2015, Late 2015)

Not shown:

VESA Mechanism Plate

- 923-0422 (Late 2012)
- 923-0532 (Late 2013, Late 2014, Mid 2015)

- 923-00657 (Late 2015)

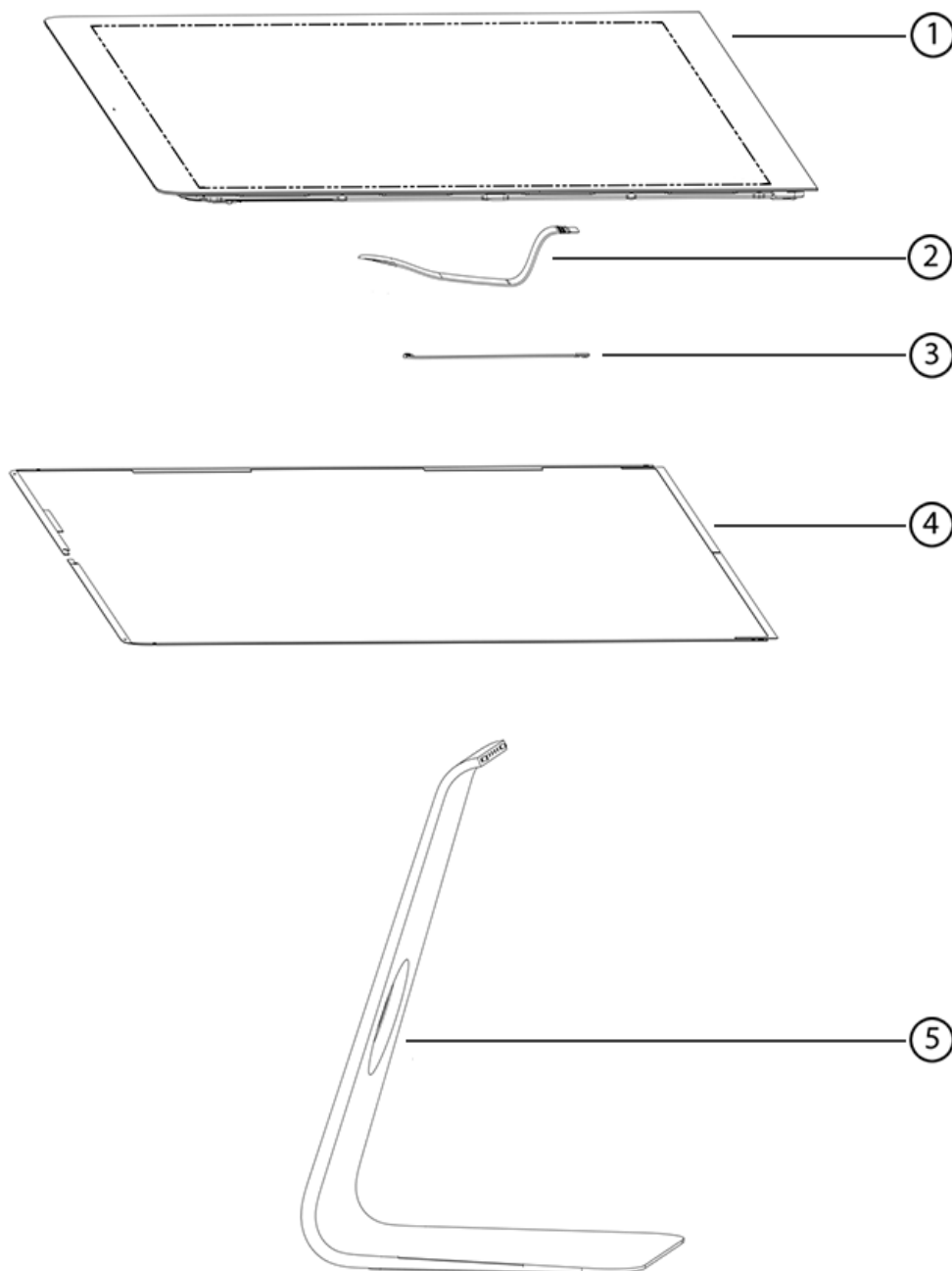
VESA Tongue

- 923-0423 (Late 2012, Late 2013)
- 923-00084 (Late 2014, Mid 2015)
- 923-00654 (Late 2015)

Latch, RAM Door

- 923-0402 (Late 2012)
- 923-0553 (Late 2013, Late 2014, Mid 2015)
- 923-00658 (Late 2015)

Exploded View 3



1. Display Panel, LCD

- 661-7169 (Late 2012)
- 661-7885 (Late 2013)

- 661-00200 (Late 2014, Mid 2015)
- 661-03255 (Late 2015)

2. Cable, Embedded DisplayPort (eDP)

- 923-0308 (Late 2012, Late 2013)
- 923-00093 (Late 2014, Mid 2015)
- 923-01087 (Late 2015)

3. Cable, Thermal Sensor, Display

- 923-0310

4. Very High Bond (VHB) Adhesive Strips

- See article [TP818: Required Tools](#).

5. Stand

- 923-0299 (Late 2012)
- 923-0529 (Late 2013)
- 923-00083 (Late 2014, Mid 2015)
- 923-00653 (Late 2015)













Note: Some coin cell batteries used on Mac systems are now available only from electronics parts distributors (for example, MCM). The coin battery is no longer available to order via GSX. When the Mac repair process indicates the coin battery needs to be replaced, please order it from an electronics parts distributor. **Note:** BR2032 and CR2032 batteries have the same form factor and nominal voltage. However, BR2032 batteries have a lower self-discharge rate and broader operating temperature range than CR2032 batteries for longer shelf and service life.

Screw Chart

Screw Chart for iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

Note: Screws are not to scale.

923-0328 T8  Flash storage (1)	923-0336 (Late 2015) T8  Flash storage (1)	923-0329 or 923-00529 T8  Stand (9)
923-0331 T8  Logic board (5), Power supply (2), Hard drive bracket (4)	923-0332 or 923-00669 T10  Fan (3)	923-0333 T10  Right speaker (2), Left speaker (2)
923-0334 T10  Mechanism (6)	923-0338 Phillips #00  Chin strap: <ul style="list-style-type: none">• Late 2012 (5-hole)• Late 2013, Late 2014, Mid 2015, Late 2015 (9-hole)	923-0304 T4  Bluetooth antenna (2), Middle Wi-Fi antenna (2), Lower Wi-Fi antenna (2)

<p>923-0396 T8, 23 mm</p>  <p>Power supply (2), Logic board (3)</p>	<p>923-0339 T5</p>  <p>Camera (2)</p>	<p>923-0394 T5</p>  <p>Wireless card (2)</p>
<p>923-00609 (Late 2015) T5</p>  <p>Wireless antenna brackets (2)</p>	<p>923-00670 (Late 2015) T4</p>  <p>Wireless card (2)</p>	<p>923-0395 T10</p>  <p>Heat sink (1)</p>
<p>923-0377 T8, 8.13 mm</p>  <p>Hard drive (4)</p>	<p>923-0399 T25, 13.84 mm</p>  <p>Power supply standoff (1)</p>	<p>923-0520 T25, 20.81 mm</p> <p>Note: Use only with rear housings 923-0522 (9-hole chin) and 923-00081 (Late 2014, Mid 2015, Late 2015).</p>  <p>Power supply standoff (1)</p>
<p>923-0521 T25, 20.81 mm</p> <p>Note: Use only with rear housing 923-0522 (9-hole chin).</p>  <p>Hard drive standoff (1)</p>	<p>923-00767 (Late 2015) T8, 17.80 mm</p>  <p>Logic board to rear housing (1)</p>	<p>923-0404 T5</p>  <p>RAM access door latch (4)</p>

923-0418
Pentalobe



VESA (2)

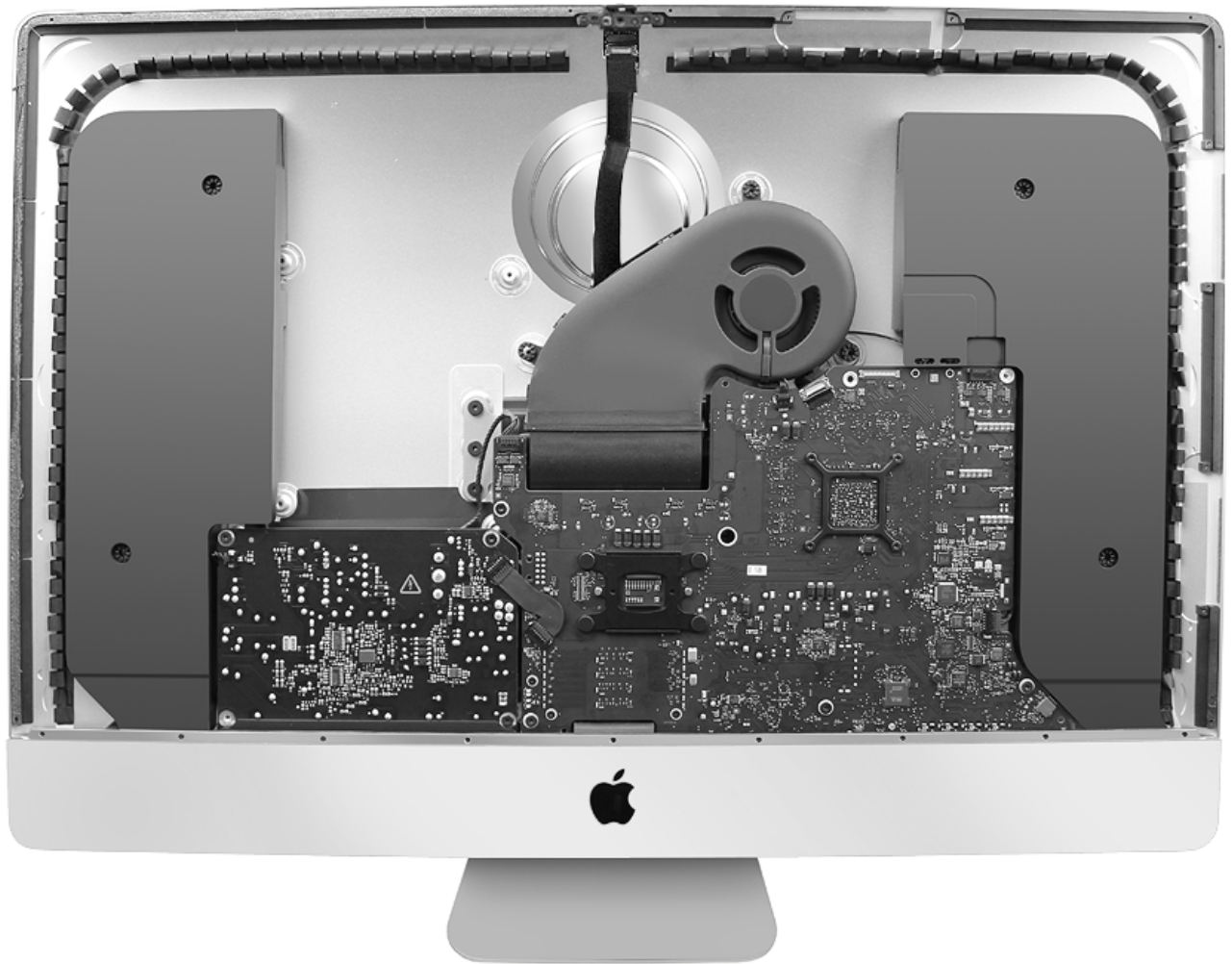
Internal Views

Internal Views of iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)

iMac (27-inch, Late 2012)



iMac (27-inch, Late 2013): Flash Storage Configuration, No Hard Drive

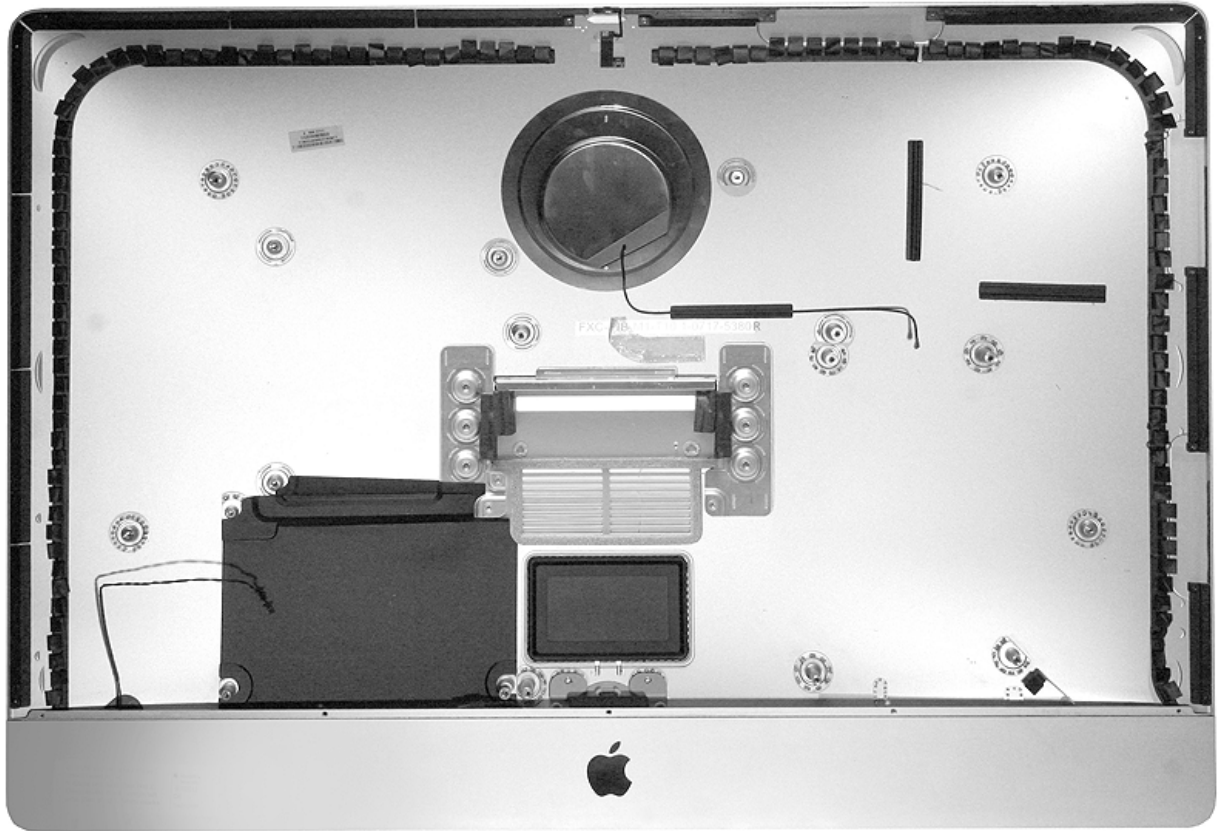


iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



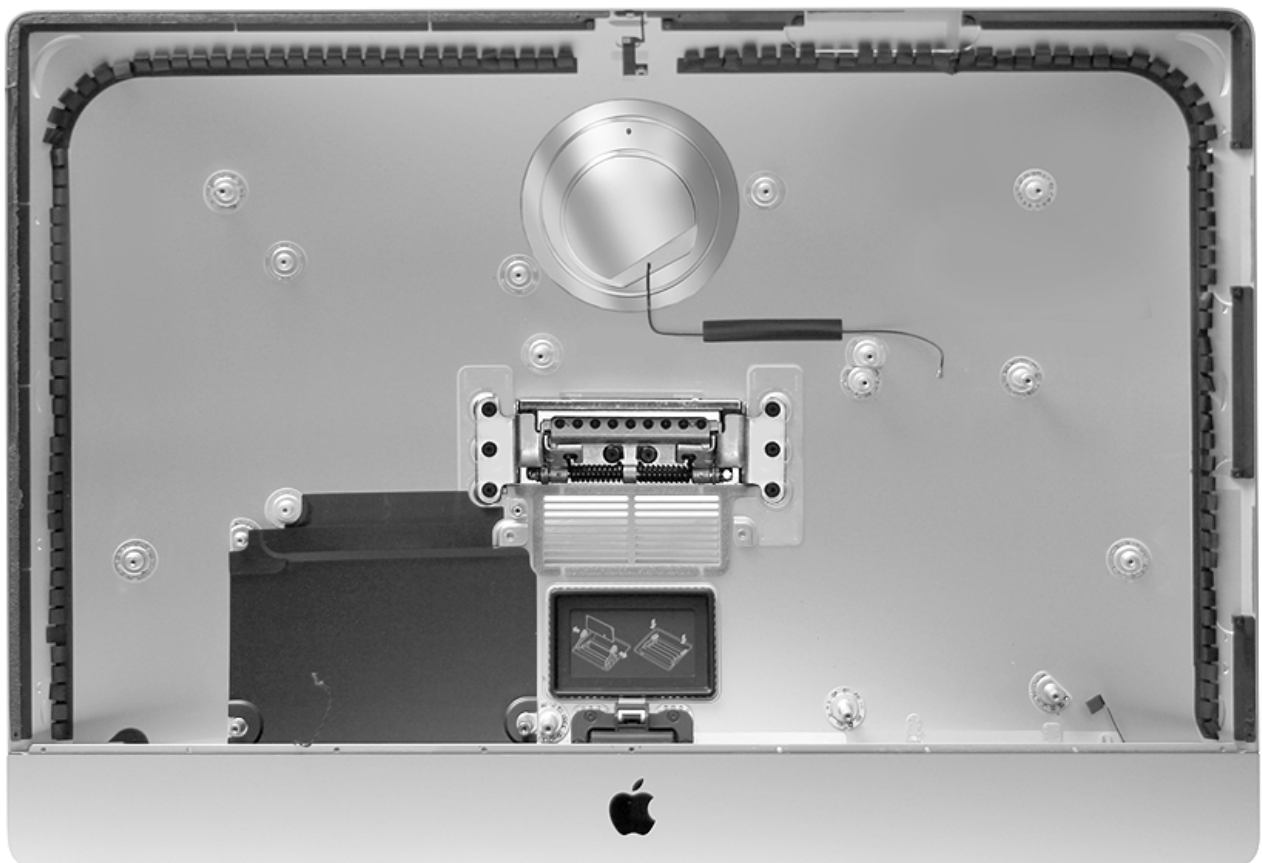
iMac (27-inch, Late 2012) Rear Housing (5 holes on chin)

Note: This part has been replaced by the 9-hole rear housing.

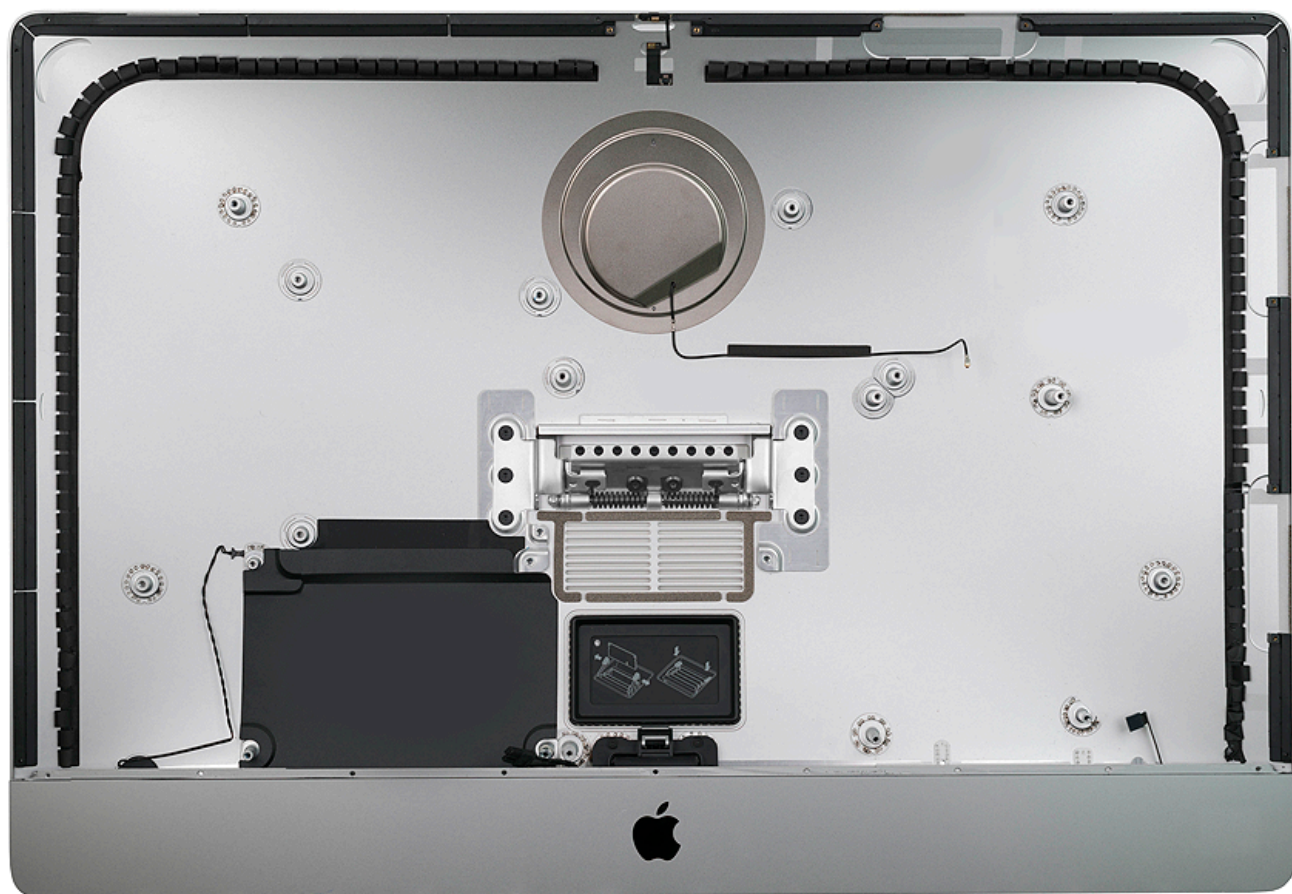


iMac (27-inch, Late 2013) Rear Housing (9 holes on chin)

Note: The 9-hole chin strap is included with the rear housing.



iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015) Rear Housing (9 holes on chin)



External Views

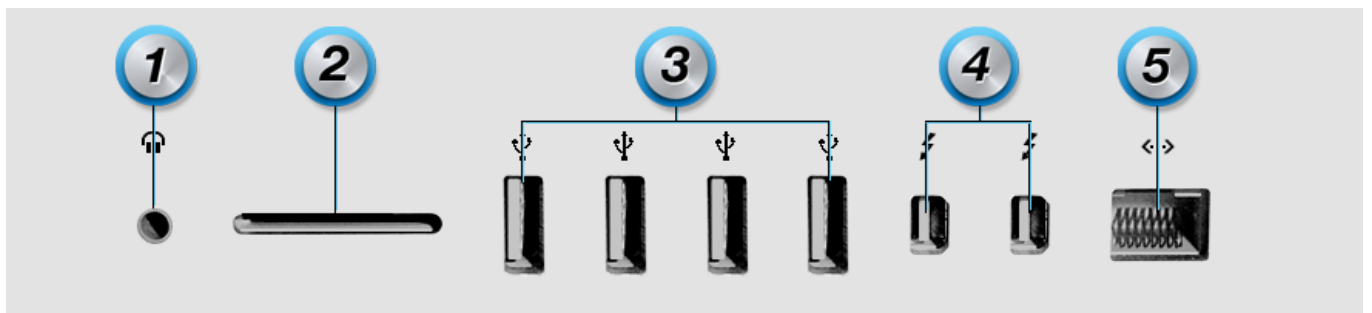
External Views of iMac (27-inch, Late 2012 and Late 2013) and iMac (Retina 5K, 27-inch, Late 2014, Mid 2015, and Late 2015)



Rear View and Ports



Ports

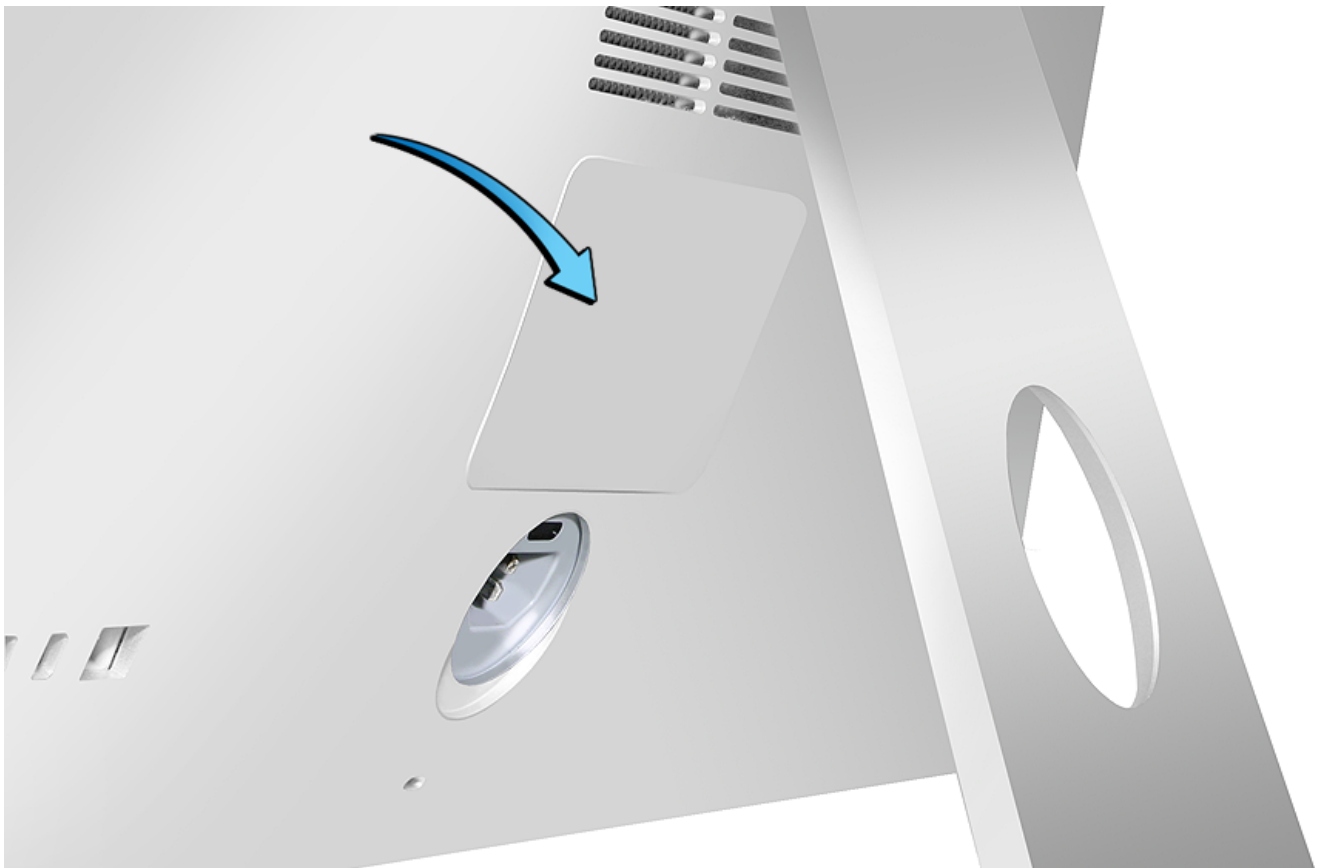


1. Headphone jack
2. SDXC card slot
3. Four USB 3 ports (compatible with USB 2)
4. Two Thunderbolt (Late 2012 and Late 2013) or Thunderbolt 2 (Late 2014, Mid 2015, and Late 2015) ports
5. 10/100/1000BASE-T Gigabit Ethernet (RJ-45 connector)

Power Button



RAM Access Door



Service Content Feedback

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